quently supported by two straight uprights from the end of the axle-tree outside the wheel; this acts as a wing or guard to keep anyone from falling out of the vehicle, and also the dress of the passengers from becoming entangled in the wheel. In addition, a long bar of wood, rather longer than the diameter of the wheel, curved in the shape called "Cupid's bow," is fastened to the axle-tree, the linchpin being outside of it, and the ends of the bar tied to the ends of the wing by cords. I imagine it to be placed in order to be a safeguard for the people in crowded streets, who might be pushed by the throng against the wheel. It will be seen in many of the models, and I have seen it also in ancient drawings of India and Persian vehicles. Many of the carts, which are designed to carry heavy loads, have a curved rest from 20 in. to 30 in. long attached to the lower side of the front end of the pole; this serves not only as a prop whilst the vehicle is being loaded, but, should the oxen trip and fall, it supports the cart, and prevents the load, yoke, and harness from weighing down the poor animals as they struggle to recover themselves. In England we have very few of these humane contrivances; we have, however, short rests to prop up a hansom cab when not at work. In India there are several huge unwieldy structures on wheels called "idol cars;" the name of the car of Juggernaut must be familiar to many. The wheels of some of these are enormous blocks of stone shaped and drilled for the work. In the Indian Museum there is a photograph of an idol car from South India, in the district of Channoodie and the province of Mysore, which deserves examination. The car appears well proportioned, and the ornamental carvings are beautiful in design, and would bear comparison with most European work.

The *Hecca* or *Heka* is a one horse native car, resembling an Irish car; it consists of a tray for the body, fixed above the wheels on the shafts, and has a canopy roof; the driver sits on the front edge of the tray, and the passenger cross-legged behind him. The *Shampony* is the usual vehicle for women, which resembles the former, but it is larger; the wheels are outside the body, and it is drawn by two bullocks; the canopy roof is furnished with curtains that are drawn all round, and the driver sits on the pole in front of the body. All these native vehicles have wooden axles, which, until recently, I am told, were used without grease, from the prejudices of the people forbidding them to use animal fat. Some used olive oil or soap, but in most large towns there are now regulations obliging the natives to use some substance to avoid the noise and creaking of the dry axles. The commonest carriages in Central India are called "Tongas," but the universal native word for a vehicle is "Gharri." In Calcutta are several coach-builders of repute, who employ large numbers of native workmen; Messrs. Dyke employ 600; Messrs. Stewart & Co., 400, and Messrs. Eastman, 300. The men are chiefly Hindoos, and are clever and industrious, but have a singular habit of sitting down at their work. The laborers, who have to use grease, are all Mohammedans. The wages vary from sixpence to two shillings per day.

A representation of a primitive vehicle, which was in the use of Hungary not very long ago, is given by Von Ginzrot as representing the Roman *rhedum*. It is very curious, and just such a primitive affair as might be made in any country. The body is a disguised wagon; the tilt top has two leather flaps, to fall over the doorways; the panels are of wicker work, such as was in common use for carriages both in Greece and Italy; and of such a character we may suppose the wagons were which were used by the many wandering tribes that, in the times of the Roman empire, poured out of Asia and Russia, and invaded Germany, Gaul, and Italy. In the history of Julius Caesar's wars in Gaul, we are told of the large number of wagons which the savage wandering tribes possessed.

Another primitive vehicle is the Turkish "Araba," used for the conveyance of women. The lattice work admits air without too much light. The singular wing-guards over the wheels identify this "Araba" as being derived from the same source as the carriages of Persia and Hindostan. These vehicles have been superseded in many parts of Turkey, Asia, and Egypt by carriages sent from the West of Europe.

In 1860 a carriage was made for one of the ladies of the Sultan's harem, which consisted of silver as far as possible. It cost, it is said, 2,000,000 Turkish piastres, about £15,000; a very expensive present for the ruler of Turkey to make to one out of many wives.

To speak of one more primitive carriage. Dr. Edgeworth describes some cars which were in use in his time (that is in 1800) in Ireland, as the common vehicles of the country. They were composed of shafts with cross bars; two low wheels of solid wood were wedged on to the axle-tree, so as to form one piece, like a railway axle and wheels; they were nearer together than the shafts, and ran inside the shafts; the axle projected beyond the wheels, and moved in sockets beneath the shafts. These cars, Dr. Edgeworth says, "cost only four guineas, including painting; they would follow a horse anywhere, they could scarcely be overturned even with bulky loads, they were light and easily moved by hand, their repair was easy, and they lay so near the ground that they could be easily loaded and unloaded; the whole would turn in a very small compass." It is probable that these were the primitive cars of Ireland. The nearest approach to them in the present day are the costermongers' barrows. We have noticed how light and simple are these vehicles, and that a wretched pony or donkey will canter along with three or even four persons sitting upon them. They also resemble the Yarmouth cart, in which the wheels are inside the shafts; but then the difference is that the shafts of the Yarmouth carts are of great length, and the load is carried between the horse and the wheels instead of over the wheels, as is usual in a cart. In some parts of Wales cars are used of this construction, and are also supposed to be the primitive cars of that country; their wheels are solid. In Yarmouth this shape was adopted to suit the very narrow streets or alleys, which a cart made with the wheels outside the shafts could not traverse. The great length of the shafts is occasioned by the necessity of carrying a quantity of goods, such as barrels or sacks, which would tend to make the vehicle top heavy if piled up above the wheels.

The Irish jaunting car, as now built, is superior to the vehicle of 40 years ago. It was then on lower wheels, and being hung lower, the shafts pitched up in front, and the unfortunate passengers were huddled upon one another at every jolt in the road. The car was very light, a great benefit for the horse; it is easily turned and moved in a crowded thoroughfare, and is capable of conveying more luggage than might at first be supposed. The car is no doubt very cheap, and perhaps more Irish drivers are able to own their own cars than are the drivers of London cabs. Irishmen, perhaps, like the vehicle to which they are accustomed, but it will never become popular in this country.

The car, however, used in Cork, is still more uncomfortable; it is an inside car, that is, instead of sitting back to back, you sit face to face, and to most there is a hood or tilt; a very good vehicle no doubt for two persons at a slow pace, but with four persons at a trot it is the worst vehicle I had ever the misfortune to enter. If the Cork car was hung on higher wheels, and the shafts kept parallel to the ground, it would be a better vehicle; if, however, it cannot be balanced properly, it should be placed upon four wheels, like the inside cars of the North of England.

I will mention one more primitive vehicle—the cart with a tilt, with side windows, and a door behind, which is called a Coburg, and is used in the southwest of England; when on good springs, it is a very cheap and comfortable vehicle. In Belgium and Holland it is much used, and is usually built of a larger size than in England. It is, however, after all, rather like a bathing machine on wheels. It is to be found pictured in our earliest illustrations of vehicles in old English illuminated manuscripts, differing from the modern Coburg only in the want of a door and springs.

In reviewing what I have laid before you as to ancient carriages, I would say, that any one who desires to learn more about them can do so in the pages of the *London Carriage Builders' Art Journal* for 1859 and 1860, which appears to contain much of the information given by the German work of Von Ginzrot. It is interesting to observe the character of the different people illustrated in their carriages. The Egyptians, with all their learning and skill, appear to have made no change during centuries of experience; as at the beginning, so at the end, the kings stand by the charioteers, or hold the reins themselves. The Persians and Hindoos introduced luxurious improvements, and in lofty vehicles elevated the nobles above the heads of the people, and secluded their women in curtained carriages. The Greeks introduced no new vehicles, but perfected so successfully the useful wagon, that their model is still seen throughout Europe, without change of principle or structure. The Romans, on the other hand, in their career of conquest, gathered from every nation what was good, and, wherever possible, improved upon it—from Greece, the wagons; from Persia, the *harmamaza* and elevated triumphal cars; and from Hungary, the *rheda*. We may well add that the genius of the Roman nation speaks through Cicero, when he wrote, "I hear that in Britain are most excellent chariots; bring me one of them for a pattern."

THE CONSTRUCTION AND PRESERVATION OF PLATE-HOLDERS.

By W. T. BOWERS.

Most manufacturers of plate-holders deem it necessary to put in glass corners, silver wire, or something of that sort, for plates to rest upon, and they seem to think that it will not do for the plate to touch the holder, except at the corners. This is a great mistake, and the sooner they can be induced to discard glass and all other contrivances in the corners of the plate-holders, the better.

There should simply be a ledge of wood for the plate to rest upon, extending all the way round the plate-holder, just as they are made for ferrotype plates.

I know that it has been objected that, if the negative touches the holder except at the corners, there will be danger of impurities flowing from the edge of the plate on to the surface, and producing stains. But such is not the case; on the contrary, the capillary attraction prevents the free solution from flowing from the edge of the plate, and there will be less trouble from that source than when the plate rests only at the corners. From long experience I know this to be true.

As little glue as possible should be used by the maker in putting plate-holders together. No varnish of any kind should be put upon them, but they should be treated with beeswax, which may be done by heating them by holding them to a hot stove, or putting them in a hot oven, and then rubbing them with the wax. Continue to rub the wax on to every part of the holder and slide till the wood absorbs enough to fill the pores. It would be a good method to put the holders into a dish of hot wax, and let them soak if you have plenty of wax; but with large holders this plan would hardly be practicable. It is something of a job to properly wax a set of plate-holders, but when once done they will last a lifetime. I have them that have been in constant use for a dozen years or more, and apparently they are just as sound and good as when new.

Beeswax is one of the most indestructible substances known. Silver solutions have no more effect upon it than upon glass; it is proof against the action of nearly all the chemicals used by photographers. It has been used, and its value understood, by many photographers for years, but I find that there are many who do not use it, and who do not seem to know how valuable it is. They still continue to varnish their plate-holders in the old way with shellac, which is worse than nothing, or use them till they fall to pieces, with no protection at all. To such I would say, try the beeswax, and you will find that it pays.—*Philadelphia Photographer*.

NEW PROCESS FOR SILVERING GLASS.

By A. LAVAL, St. Louis, Mo.

In carrying out my invention I prepare the ingredients: I first take eighty grams of nitrate of silver (either lunar caustic or the crystallized salt), and dissolve it in ten ounces of water, preferably distilled or rain water. To this I add two ounces of alcohol and two ounces of aqua-ammonia. The ammonia is added to the solution drop by drop, until the precipitate at first formed is dissolved. The solution is then allowed to settle for three or four hours, when it is ready for use, and forms solution No. 1. I then take six ounces of water and dissolve in it twenty-four grams of nitrate of silver, and add to the same thirty grams of arsenite or tartrate of copper, and then add, drop by drop, sufficient aqua-ammonia to dissolve the precipitate of oxide of silver at first formed, and the arsenite or tartrate of copper, after which add two ounces of alcohol. I then make a separate solution of forty-eight grams of potassa in sixteen ounces of water. This last-mentioned solution is brought to a boiling temperature in an evaporating-dish, after which the solution of nitrate of silver and arsenite or tartrate of copper is added, drop by drop, to the boiling solution of potassa, and the boiling is continued for about an hour, or until a white film collects on the surface, after which it is allowed to cool and filter, when it is ready for use, and forms solution No. 2.

In depositing the alloy upon the glass, I take a suitable quantity of filtered water, preferably rain or distilled water, and add to it equal parts of solutions Nos. 1 and 2, and mix the whole thoroughly, and apply this solution in any convenient manner to the glass to be coated, and the deposition immediately commences, and is allowed to continue, say, for

about ten minutes, until the metal in solution is entirely exhausted, when the glass will be covered with a coating of the alloy, having a brilliant reflecting surface adjoining the glass.

In order to increase the durability of the coating I prefer to deposit a second coating upon the first, which is done by repeating the operation before the first coating is dry, and after the coating is completed I generally cover the whole with a heavy coat of asphaltum varnish, although this is not absolutely necessary, as the metallic alloy is sufficiently hard to stand ordinary wear without it.

By the above-described process an alloy having all the qualities of hardness and durability of the ordinary alloys of copper and silver is deposited upon the glass, and the degree of hardness may be varied or modified by varying the proportions of the different ingredients employed. Other salts of copper besides the arsenite or tartrate may be employed in conjunction with the nitrate of silver.

FIREPROOF CONCRETE.

It is a remarkable fact, says the *London Architect*, that the 1st prize medal ever bestowed by the Royal Institute of British Architects was given for an essay on the subject of concrete. This was in 1835; and Mr. George Godwin was the winner of the honor. How far the subject has progressed since then, both in scientific intricacy and in public importance, some may find it hard to understand; whilst others may only wonder how it happens that, after forty years, we should still have settled so little about it.

At the base of the general question of the use of concrete as a "fire-resisting material" (this, by the way, is a new phrase, and a very good one, which was brought forward by the officials of the Metropolitan Board in their last—unsuccessful—Building Act Bill), there may be said to lie the striking but quite intelligible proposition of Captain Shaw that common plastering is one of the very best preservatives of what it may cover from the effect of the heat of a fire. Iron, whether cast or malleable, wherever it is exposed, is virtually helpless. Stone cracks to pieces. Timber of course is fuel. Brick, or in fact any other material that has passed through intense heat in its manufacture, is necessarily fireproof to the last, except when its comparative thickness is unequal to the mechanical shocks produced by the conflagration. If, therefore, we can find a material which shall be of the nature of plastering superficially, which shall enable us to dispense with exposed iron, which shall be a substitute for stone, which shall do away with timber, and which (although it has not passed through the process of burning in manufacture) shall be substantially as good as brickwork, and as effectually fireproof if only thick enough, it is very natural that we should look with hope to this material, as one which seems obviously to be capable of being brought to bear upon the taste of fire-resistance to any degree and in any form that the conditions of building construction may incidentally require. So far as the brick walls go, it is not easy to see how they can be improved upon. Partitions also may continue to be of brick. In respect of stairs, it is very likely that terra cotta may be considered preferable to everything else. Internal doors, however, seem already to be found to be better of concrete than of iron; although it is certainly difficult to get over the fact that they cannot after all be made without iron framework. But the floors and the roof still constitute the great difficulty; and this is simply because they must necessarily be supported at short intervals. Iron pillars and iron girders are not to be thought of; even if used in armor of concrete, or whatever else, it would be impossible at present to believe in them. Brick piers probably furnish the most truly scientific way of meeting their part of the case; and in a warehouse, where mere lightness of appearance would be but an affectation, it is doubtful whether they can ever be improved upon, especially if Staffordshire bricks, for instance, be used, purpose-made. For the floors, supported by such pillars, probably concrete, if made of the best materials, might be enough without any aid from iron; but if iron cannot possibly be dispensed with, let it take the form of a diffused reticulation, and certainly not that of a series of joists, and so it may, by the exercise of ingenuity, be made capable of protection. Roofs, again, if regarded as floors, would be only a repetition of the same construction; and an external covering from the weather, composed of even timber-work and slating, need scarcely be objected to.

We have said enough, however, for our present purpose, which is to show that the task undertaken by the Council of the Institute is not to be disposed of easily; and we will only add the hope that the profession, in answering the appeal, as we may call it, of Parliament, will endeavor to do credit to its scientific character.

SULPHUR CONCRETE.

Mix together nineteen pounds sulphur and forty-two pounds pulverized stoneware and glass. This mixture is exposed to gentle heat until the sulphur melts, when the mass is stirred until it has become thoroughly homogeneous, and is then run into moulds and permitted to cool. When required for use, it is heated to 248° Fahrenheit, at which temperature it melts, and may be employed in the usual manner. At 230° Fahrenheit it becomes as hard as stone, and, it is said, preserves its solidity in boiling water, unites stone, is waterproof, resists acids.

BLACK BRICKS.

The black bricks used about Boston are colored by heating red hot, and dipping the exposed surface into a pan containing half an inch or so of melted coal tar. Soft bricks are the best. Hard bricks or hard spots prevent the tar from penetrating the surface, as it should do, to a depth of one sixteenth to one eighth of an inch, and the coating peels off.

The *American Architect* observes: This method, so far as we know, is the only one for coloring bricks after they come from the yard. It has not been in use long enough to test the durability of the result thoroughly. We have seen bricks treated in this way, which in three or four years lost their color decidedly by weathering; and others which retained it perfectly for as long a time. It is essential to its success that the bricks should be porous, and that they should be dipped very hot. On the other hand, if they are too hot, the distillation of the tar is likely to prevent its soaking into the substance of the brick. Successful coloring is a matter of experience, therefore. In some that we have seen broken, the tar had penetrated a sixteenth of an inch or more below the surface. There seems to be no reason why such bricks should not hold their color for a good many years; but all vegetable substances, we fancy, are likely ultimately to bleach.