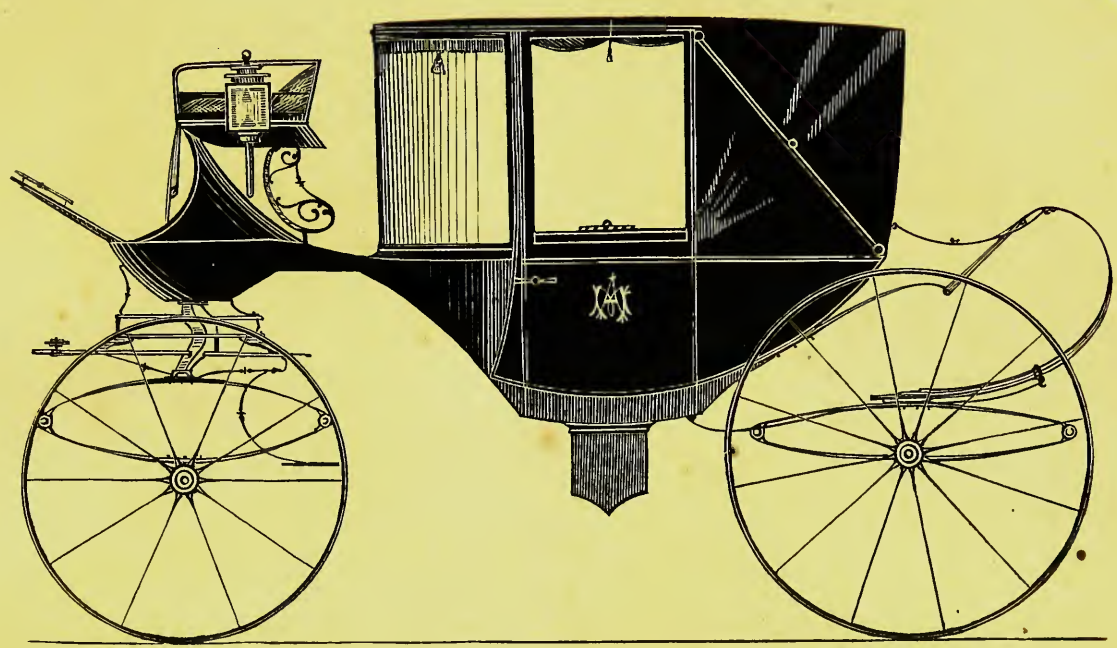
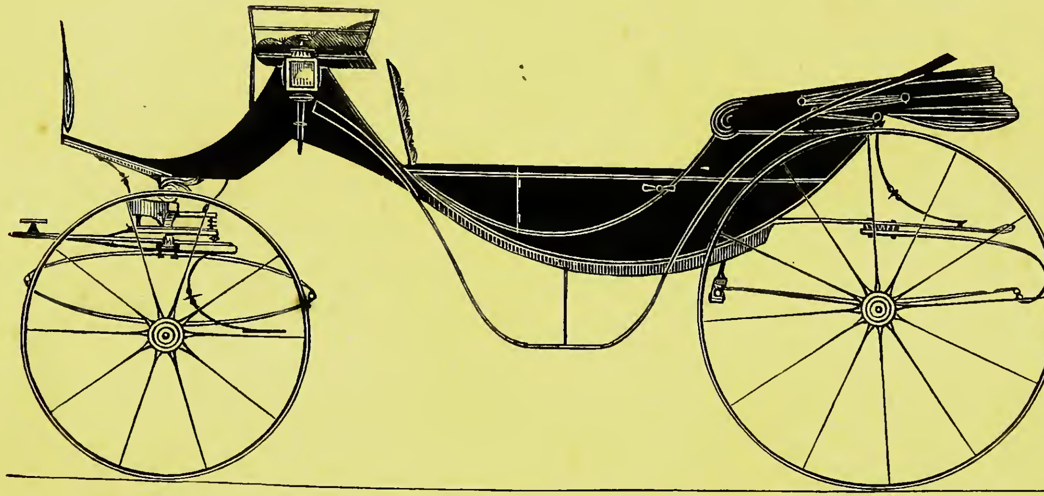


FULL-SIZE LANDAULET. — $\frac{1}{2}$ IN. SCALE.

Designed expressly for the New York Coach-maker's Magazine.

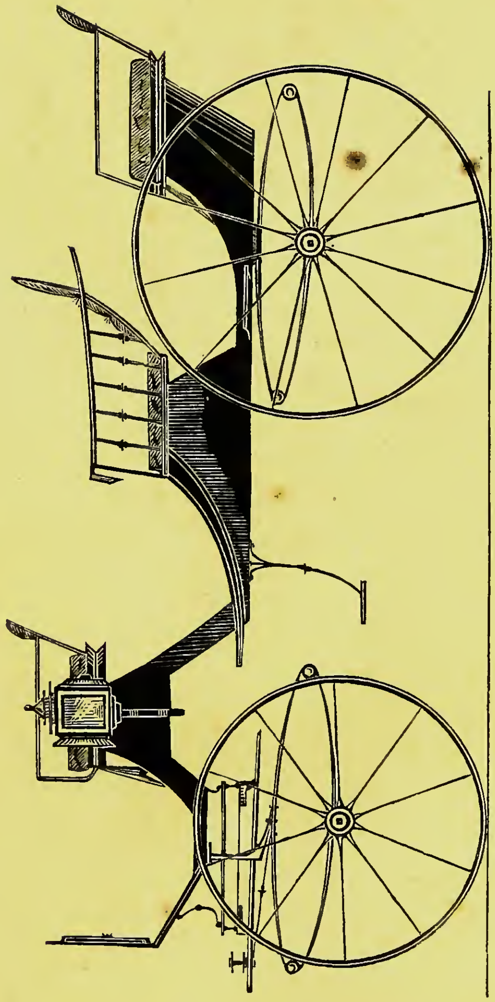
Explained on page 40.



CABRIOLET CALECHE.—½ IN. SCALE.

Dusigned expressly for the New York Coach-maker's Magazine.

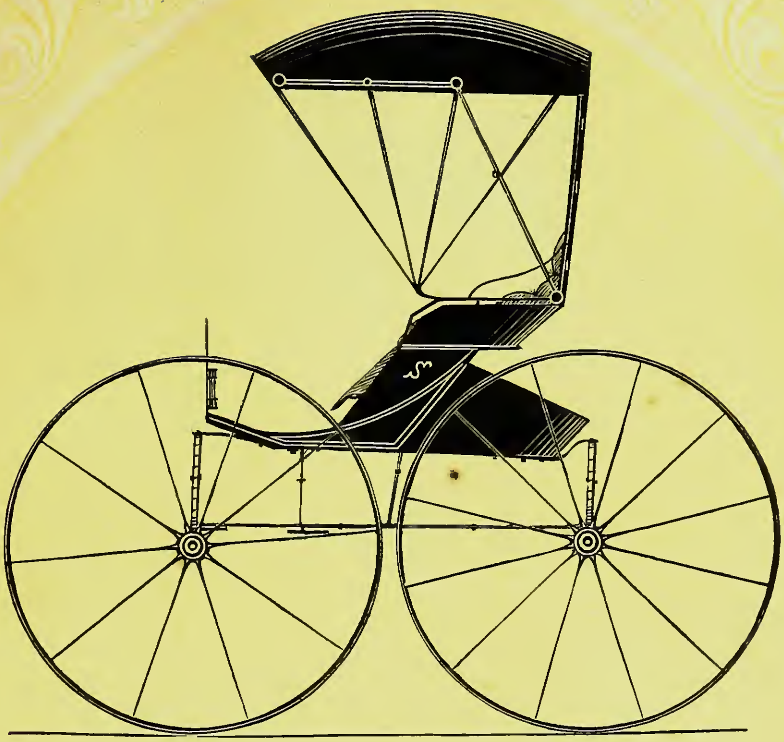
Explained on page 41.



EXCELSIOR PARK PHAETON.—$\frac{1}{2}$ IN. SCALE.

Designed expressly for the New York Coach-maker's Magazine.

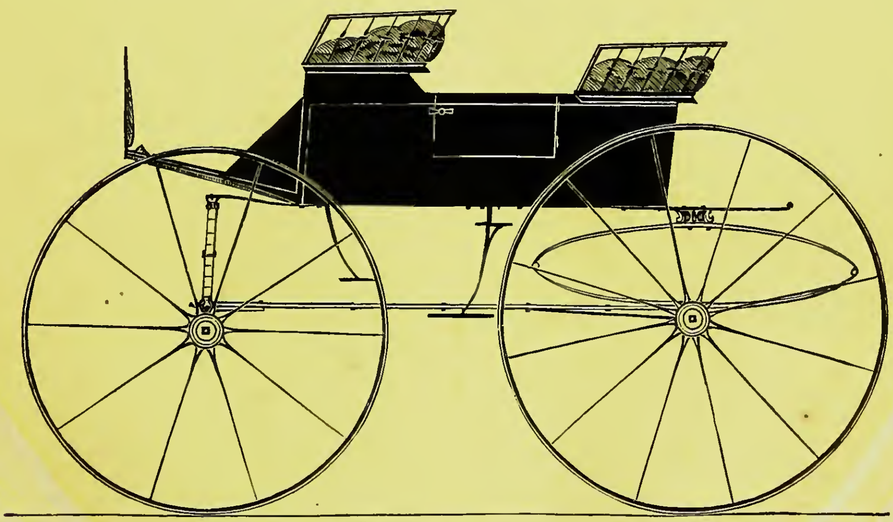
Explained on page 41.



COMPOUND BUGGY.—½ IN. SCALE.

Designed expressly for the New York Coach-maker's Magazine.

Explained on page 41.



ROAD PHAETON.—½ IN. SCALE.

Designed expressly for the New York Coach-maker's Magazine.

Explained on page 41.

DEVOTED TO THE LITERARY, SOCIAL, AND MECHANICAL INTERESTS OF THE CRAFT.

Vol. XII. NEW YORK, AUGUST, 1870. No. 3

Mechanical Literature.

TREATISE ON THE WOOD-WORK OF CARRIAGES.

(*Continued from page* 21.)

Having the projections of the triangle on a plane S, perpendicular to the axis of deployment, the question is therefore reduced that we have solved (art. 74). When the triangle is turned down upon the horizontal plane, the arcs described by each of the angles $(a\ a_{\prime})$, $(c\ c_{\prime})$, $b\ b_{\prime}$), pierce that place in points, whose vertical projections on the plane S are $a_{\prime\prime\prime}$, $c_{\prime\prime\prime}$, $d_{\prime\prime\prime}$, where the arcs described with point $e_{\prime}$ as center, and $e_{\prime}\ a_{\prime}$, $e_{\prime}\ c_{\prime}$, $e_{\prime}\ b_{\prime}$, as radii, meet M N. The horizontal projections of the same points are, for the angle $(a\ a_{\prime})$, the point A, the intersection of the lines a A and $a_{\prime\prime}$ $A_{\prime}$, the first being perpendicular to the axis $d\ e$, and the second perpendicular to the intersection M N. The same refers to the other angles, the arcs of which pierce the horizontal plane in B and C. On joining the points A, B, and C by the lines A B, A C, and B C, the triangle A B C formed by them is the triangle sought for.

LXXIX. Instead of turning over the triangle $(a\ b\ c,\ a'\ b'\ c')$ on to the horizontal plane, it can be brought into a parallel position to the first vertical plane Q, by two rotary movements, and the new projections that will result on that plane can be constructed. The first rotary movement, for instance, could be executed around a vertical axis of the point d, until the line $d\ e$ be brought parallel to X Y. In this movement, all the horizontal projections would preserve their relative positions. The second movement would take place around $d\ e$, until the triangle be brought into a vertical position. Then, in order to construct the length of the radii of the arcs from each point taken, it would require a plane perpendicular to the axis, or deduct the lengths of the two projections of each radius in like manner as that adopted hereafter in reference to a line. This second method, by which to construct the triangle in its full size, would be longer than the first, because there would be an additional rotary motion. Therefore there would be two projections on the horizontal plane, the projection $a\ b\ c$, and another after having brought the line $d\ e$ to bear parallel to X Y; there would likewise be an auxiliary plane S, and two projections on the vertical plane Q; firstly, $a'\ b'\ c'$, which already exists, and secondly, that which must be constructed when the triangle is brought to bear parallel to that plane: in all, five projections; whereas, by deploying the triangle on to the horizontal plane, there would be but four.

The constructions requiring the fewer projections must in all cases be preferred, because, however great may be the precision and attention exercised, in practice there are at all times causes for error, either arising from the imperfection of the instruments or the physical means that are employed. It therefore naturally follows that the causes of error are multiplied in proportion to the number of projections.

LXXX. Observations.—The table of all the graphical constructions that will be presented by the operations being for the purpose of determining in their size, the lines, surfaces, and dihedral angles, will only offer a repetition of the constructions that we have just executed in reference to a triangle (art. 72 to 79).

According to the position of the triangle, or of any other plane surface under consideration, in respect to the planes of projection, the operation being for the purpose of bringing that surface either parallel to one of the two planes of projection, or on one of those planes, it can be carried out: firstly, by turning over or deploying (art. 74, 75, and 76); secondly, by a rotary movement (art. 77); thirdly, by a change of the plane of projection, and turning down (art. 78); fourthly and lastly, by two rotary movements and a change of the plane of projection (art. 79).

LXXXI. Deploying indicates the operation that consists in moving the surface considered in space, in order to bring it to bear upon one of the two planes of projection. Then the axis of deployment is the common intersection of the plane of projection and the surface in space, extended if necessary.

According to the position of the surface in space, the axis of rotation can occupy four different positions on one of the two planes of projection, in reference to their common intersection: it can be confused with that line, parallel, perpendicular, or oblique to it.

LXXXII. Under the name of axis of rotation, it is more particularly designated a line perpendicular to one of the two planes of projection, and passing through one of the extreme points of the surface in question. Hence it follows, that if the axis is perpendicular to the horizontal plane, for instance, each point of the surface, in turning around that axis, describes a horizontal arc, which is projected with its radius in full size on the horizontal plane, and on a line parallel to the ground line, on the vertical plane, and reciprocally. Then it is not at all necessary to construct the two projections of the axis of rotation. It suffices to indicate on the plane of projection perpendicular to the axis the projection of the point through which it passes. Therefore, in the article 79, it would have sufficed to state that the triangle is turned around a vertical axis of point *c*.

The axis of rotation furthermore infers a line parallel to the intersection of the two planes of projection, and taken on one of those planes, around which a surface in space is moved, in order to bring in a position parallel to the other plane of projection.

LXXXIII. In reference to the operation having for its object the bringing over of a surface on to a plane of projection, or in a position parallel to one of those planes, which is effected by deploying, by a rotary motion, or by both, it is necessary to remark:

Firstly. That every point of the surface in question, in turning around a fixed axis, describes a circumference or an arc, the plane of which is perpendicular to the line taken for the axis of rotation.

Secondly. That the circumference or the arc described by each point is projected with its radius in their full size, on a plane perpendicular to the axis, and by a line perpendicular to the axis, on any plane passing through that axis.

Thirdly. That the center of the circumference, or of the arc described by each point, is included in the axis, or in its extension, at the intersection of that axis and the plane of the circumference or the arc.

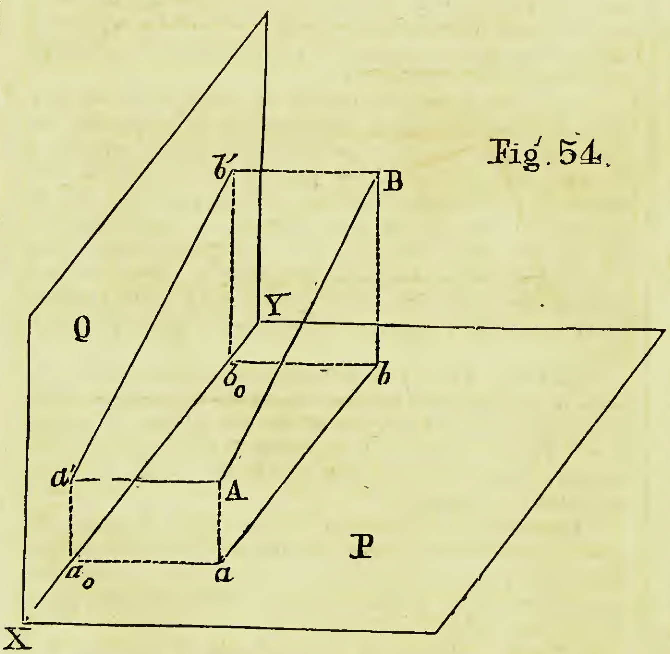
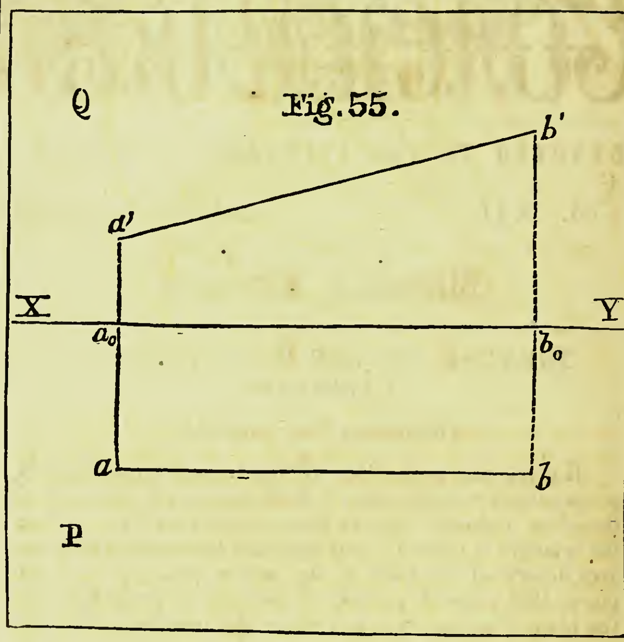


Fig. 54.

LXXXIV. Operations on Straight Lines.—Operations on straight lines in space are for the purpose of fixing their length. Frequently the determination of the length of a line suffices to secure the size of the plane surface to which that line belongs.

To find the Length of a Line, the two Projections of which are given.—If the proposed line is parallel to one of the two planes of projection, its length is determined by its projection on that plane (art. 52). Let A B (fig. 54) be the proposed line, and parallel to the vertical plane Q. Its projection $a'\,b'$ on that plane will be equal and parallel to it. It is acknowledged that a line



A B is parallel to one of the two planes of projection Q when its projection *a b*, in the other plane P, is parallel to the ground line X Y, so as to have $a\,a_0$ equal to $b\,b_0$. The figure 54 is in perspective, but in that respect we give figure 55, that presents the same given points, with the points marked with the same letters, on geometrical planes. The line A B is represented on those two planes by its two projections ($a\,b$, $a'\,b'$).

If the line is inclined in any manner whatever, in respect to the planes of projection, its length is greater than that of each of its projections, which in that case are oblique to the ground line. The length of the line is reduced by the aid of its projections, by one of the constructions effected later, the solution of which we give below.

Solution.—The proposed line, with its two projections on either of the two planes of projection, and its projection on that plane, form a rectangular trapeze determined by the two planes of projection. One of those planes contains the projection that forms the basis of the trapeze, and the other the length of the two adjacent sides that, together with the basis, form the two right angles of the trapeze; the fourth side expresses the length of the proposed line. It therefore remains but to construct that trapeze on either of the planes of projection.

Suppose A B (fig. 56) to be the proposed line projected in perspective on two planes, one of which P is supposed horizontal, and the other Q vertical. Let us first consider the vertical trapeze formed by the line A B, by its two projectants A *a*, B *b*, and by its projection *a b*

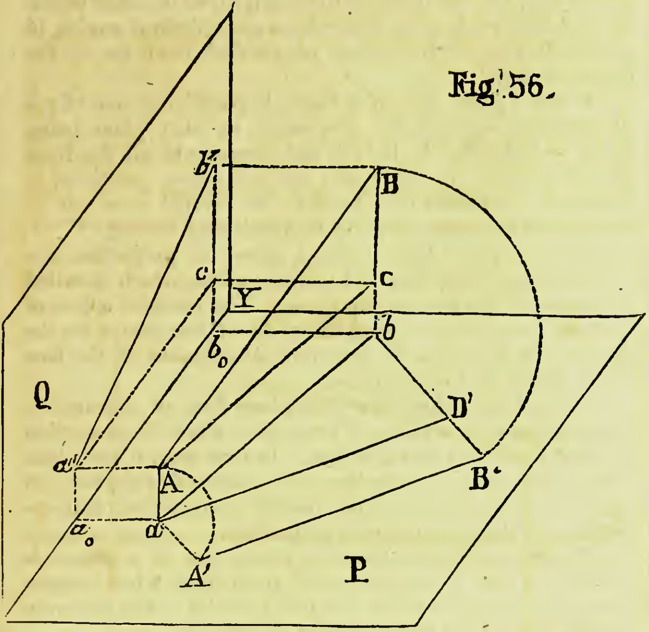


Fig. 56.

on the horizontal plane. The trapeze is now figured in space, while it is only represented on the planes of projection by three of its sides: the horizontal projection *a b*, which forms its basis, and the two adjacent sides to that basis, the lengths of which are expressed by the lines $a' a_0$, $b' b_0$, lowered from the extremities a' and b' of the other projection perpendicular to X Y, which (art. 46) are respectively equal to the projectants A *a* and B *b*, each one measuring the distance from the extremities of the line A B to the horizontal plane.

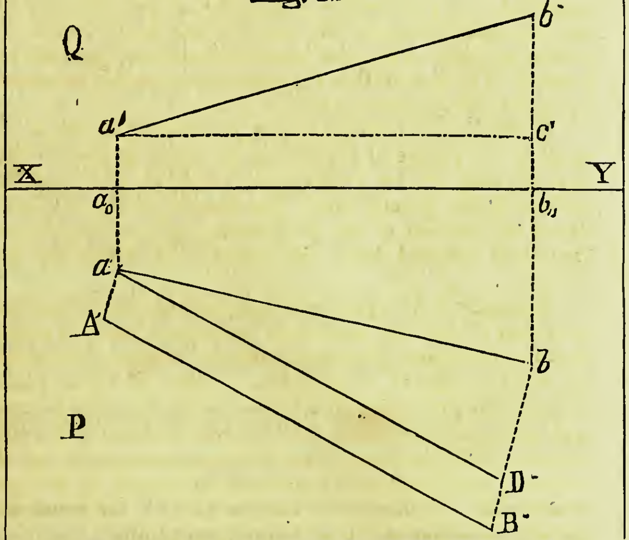


Fig. 57

In order to construct the trapeze on that plane, indefinite perpendiculars *a* A' and *b* B' are drawn to the projection *a b*, by its extremities *a* and *b*, on which the distances $a' a_0$, $b' b_0$ of the plane Q are measured off from *a* to A', and from *b* to B'. The line A' B' drawn by the points A' and B' expresses the length desired. In reality, the trapeze A' *a b* B', constructed on the horizontal plane, is equal to the trapeze A *a b* B in space, having a common basis *a b*, the two sides A' *a*, B' *b* respectively equal to the two sides A *a*, B *b*, and perpendicular to the basis, the fourth side of which A' B' is equal to A B.

The figure 57, on geometrical planes of projection, expresses the construction indicated on the figure 56 in perspective, with the same points marked with the same letters. Here the line in space is represented by its two projections (*a b*, *a' b'*), and the sides of the right angles of the vertical trapeze that passes that line, and by its horizontal projection *a b*, are represented by the vertical lines $a' a_0$, $b' b_0$, which are respectively carried from *a* to A' and from *b* to B'.

LXXXV. If the horizontal plane P (fig. 56) be elevated until it touches the line A B at its lower end A, the new horizontal projection of the line will be found transferred to A *c* parallel to *a b*, and the ground line in *a' c'* parallel to X Y. Then the line A B is equal to the hypothenuse of a rectangular triangle A *c* B, the sides of the right angle being the horizontal projection A *c* and the elevation B *c* or *b' c'* of the other extremity of the line above the horizontal plane.

To construct this triangle on the horizontal plane, it will be observed that the projectien *a b* being equal to A *c*, one of the sides of the right angle, it suffices to draw

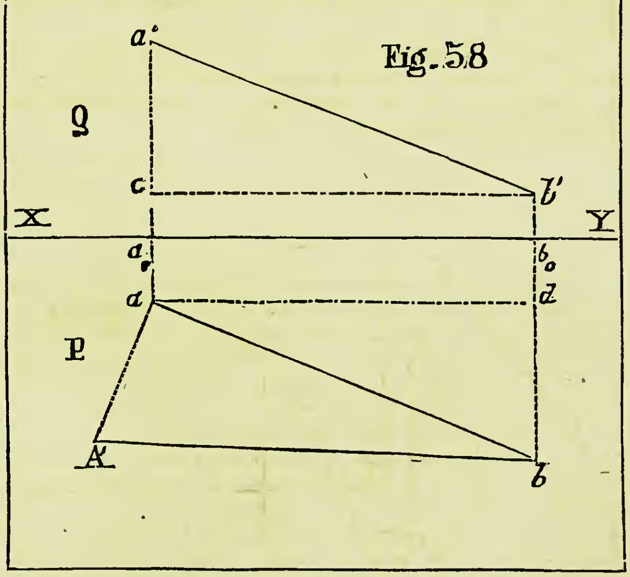


Fig. 58

a perpendicular *b* D' to that line by one of the extremities *b*, and to carry over on to that perpendicular the other side of the right angle B *c* or *b' c'* from *b* to D. The line *a* D' that joins the points *a* and D' is the hypothenuse of the triangle *a b* D', equal to the triangle A *c* B. The same construction is made on the geometrical planes of figure 57.

The two planes of projection being rectangular, the operations that have been effected on one (figs. 56 and 57) could have been carried out upon the other, and would have yielded the same result. In general, whatever may be the plane of projection considered, the length of a line in space (*a b*, *a' b'*) (fig. 58), when oblique to two planes of projection, is equal to the hypothenuse A' *b* of a rectangular triangle A $a\,b$, of which the sides of the right angle are: 1°. The projection $a\,b$ from the line on to one of the two planes of projection; 2°. The difference $a'c'$ of the distances of its extremities $a'\,a_0$, $b'\,b_0$, to that plane.

If the vertical projection $a'b'$ of the line is taken for one of the sides of the right angle, the other side will be the difference $d\,b$ of the distances of its extremities $b\,b_0$, $a\,a_0$, to that plane.

Or, if one of the extremities of the line touches a plane of projection, its length is equal to the hypothenuse of a rectangular triangle, of which the sides of the right angle are: 1°. The projection of the line on the plane that it touches; 2°. The distance of the other extremity of the line to that plane.

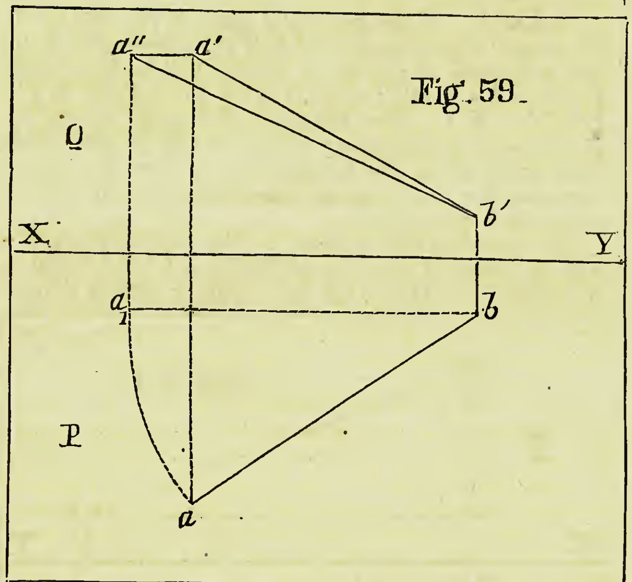


Fig. 59.

LXXXVI. Suppose ($a\,b$, $a'\,b'$) (fig. 59) to be the horizontal and vertical projections of a line. In order to find the length of that line by one of the simplest constructions, it is brought to bear parallel on to one of the planes of projection—for instance, to the vertical plane—by turning it around a vertical axis of the point b, until its horizontal projection $a\,b$, be brought to $a_{,}\,b$, parallel to X Y. In the movement, the point ($a\,a'$) describes a horizontal arc, which will be projected in its full length on to the horizontal plane according to the arc $a\,a_{,}$, described from the point b as center, and by a horizontal line $a''\,a'$ on to the vertical plane. Now when the line is parallel to the vertical plane, the point ($a\,a'$) stands at $a_{,}\,a''$, and the line $a''b'$, which joins the two points a'' and b' is the line required.

LXXXVII. Operations on the Plane Faces of Frames.—The operations on the plane faces of frames are for the purpose of deducting the size of those faces by the aid of given projections.

When the size of a face is determined on a plane, as well as all the lines of construction that belong to it, it is then only necessary to transfer the results on to the face of the piece of wood for which they are intended. But the manner of proceeding in transferring the operations effected on to the face of pieces of wood requires a special article, which will be treated in the second part. In this chapter, we only explain the methods to be employed in construction on planes of projection, plane faces and dihedral angles, in their full size, as they must be carried over on to the pieces of wood.

When a plane face of a frame is parallel to one of the planes of projection, its projection on that plane being equal and parallel to it (art. 55), represents all the lines of construction in their size and respective positions, in the same manner as they have to be carried over on to the face of the piece of wood to which they belong.

When a plane face meets a plane of projection, the intersection of that face and plane is a line, which is called the trace of the face on the plane. The trace of a face of a frame on a plane of projection, or of the plane on the face of the frame, is the common intersection of the face of the frame and of the plane.

It is acknowledged that the plane face of a frame is perpendicular to a plane of projection, when its projection on that plane is a straight line. In that case, if the plane face of the frame meets the other plane of projection, its trace on that plane is perpendicular to the common intersection of the two planes of projection.

It is acknowledged that the plane face of a frame is parallel to one of the planes of projection, when its projection in the other plane is a line parallel to the common intersection of the two planes of projection.

The operations now about to be solved on different faces will convey a more general idea.

(*To be continued.*)

THE COACH FACTORY OF WM. D. ROGERS.

The following description of the coach factory of Mr. Rogers, in Philadelphia, appeared in a late newspaper of that city. We give it in full:

There is one kind of success which affords the very largest amount of satisfaction to him who achieves it. We mean success in business, especially a productive business, such as some branch of manufacture. The artist, poet or philosopher may succeed in acquiring fame, and yet not live long enough to enjoy the tardy fruits. Wealth, with its concomitant comforts, conveniences and luxuries, may, indeed, never flow in upon him, and pinching poverty not unfrequently is his lot through life. In brief, he may be successful and yet miserable. Not so with the successful manufacturer. He has not only the gratifying consciousness of having organized victory over competitors at home and abroad, of having built up by untiring, persevering labor and the exercise of much administrative talent and important industry, which is of benefit to the State, and which affords occupation and sustenance to many mechanics and laborers, but also the more material attraction which comes only from the possession of a comfortable bank account.

Prominent among the Philadelphians who now enjoy such a twofold satisfaction is

WILLIAM D. ROGERS,

whose name is indissolubly associated with the construction of fine carriages. Like almost every other manufacturer who has attained eminence in his business, he was the architect of his own fortune. In his earlier days he was a journeyman coach-builder, noted even then for his industry and skill as a workman. In this capacity he traveled all over the United States, the Canadas, and the

West Indies, working at his trade in various places, and at the same time thoroughly acquainting himself with the peculiar wants of all these different localities, thus laying the foundations of his subsequent success as the founder of a great manufacturing establishment which now sends large numbers of carriages and light vehicles of all kinds, not only to the countries mentioned, but to Europe.

HISTORY OF THE ESTABLISHMENT.

In 1846 Mr Rogers, still a young man, laid the basis of what is now his great establishment. He commenced the manufacture of coaches in a small building at the corner of Sixth and Brown streets, employing at first only a very few hands, but supplementing their work with his own experienced labor. The business increased so rapidly that by 1853 it was necessary to have much larger accommodations, and new shops, 172 by 137 feet, were built at Sixth and Master streets. These were four stories high, and fitted with every convenience and appliance for carrying on the business in the most extensive manner.

But the fame of his carriages spread abroad; orders came in from all quarters, and for the convenience of city customers, as well as those from abroad who desired to select from a large stock, the present

WAREROOMS,

at 1009 and 1011 Chestnut street, were opened in 1857. Three years later, in 1860, the rear portion of this building was fitted up as a workshop. It having been found necessary now to concentrate the business, in order that the indefatigable proprietor might have the whole under constant surveillance, the shops at Sixth and Master were discontinued, and in 1865 a large four-story brick building on Filbert street, directly in rear of the one occupied on Chestnut street, was converted into workshops.

DESCRIPTION OF THE PRESENT WORKS.

A full account of the various shops and departments comprising Mr. Rogers' present works, with some explanation of how his coaches are made, would contain much of general interest. Persons passing the capacious establishment on Chestnut street have generally no idea that a large portion of the same building is full of busy workmen, engaged in fabricating and finishing the beautiful and stylish vehicles which are afterwards placed there on exhibition, and which fairly dazzle by their brilliant varnish the eyes of all beholders. Yet so it is. Customers, after looking through the warerooms and selecting the style of carriage which suits them, can, if they desire one made to order, step up stairs and see the tough hickory which is to be fashioned into the wheels, and the rich satins and cloths to be used for trimming.

On our trip through the establishment recently, we entered first the building at 1016 and 1018 Filbert street, which is fifty-four by seventy-five feet, and four stories high. In order to follow the natural order of the work we began with the third story, where is located the

BODY-ROOM.

This is a large apartment, occupying the whole of the third floor, in which the carriage bodies are made from drawings furnished by competent draughtsmen employed in the establishment. The lumber used is hickory, ash, poplar, and some little cherry. This is all seasoned from two to five years, and large quantities of lumber are always kept carefully housed under sheds in the yard and in the rear portion of the second story. The work is generally done by hand, very little machinery being employed. The foreman of the room and many of the mechanics "served their time" here, and it is needless to add that they are thorough workmen.

The fourth story above is used as a general storeroom for bodies, wheels, &c., which, after being "primed," or given one coat of paint, are raised to this room by means of an ordinary hoisting apparatus. After remaining here till thoroughly dry, they go to the smith-shop to be "ironed."

THE CARRIAGE-PARTS SHOP

is situated on the second floor. Here a number of the most skillful and experienced mechanics were busily engaged in fashioning the finest and strongest pignut hickory wood into running gears or carriage-parts. As in the former shops, the work is principally done by hand, and the utmost care is exercised to see that no faulty wood is incorporated, and that every step of the work is done in a thoroughly first-class style.

CUSTOMERS' CARRIAGES

are stored in a large room on the front of this floor, which is devoted exclusively to this purpose. A small rental is charged, which covers also the insurance against fire or other accident. A large number of elegant carriages are now stored there, showing that a considerable demand exists for such a storeroom. On the first floor is

THE BLACKSMITH SHOP,

where all the wood-work of the heavier carriages is ironed. The noise of many hammers, files, and other tools, wielded by stout and skillful Vulcans, fills the place with sounds which are but music to the ear of Mr. Rogers. To us they were rather discordant and distracting, and having more taste for the beauties of the finished work, we hurried on. We learn that the material used here is the very best Swedish, Norway, and Ulster iron, and, for some portions of the work, Bessemer steel. It is by this careful choice of material that Mr. Rogers secures such remarkable strength and durability in combination with great lightness and symmetry. Crossing over to the

CHESTNUT STREET BUILDING,

we found this to be 45 feet in width and to extend from Chestnut street back to the Mercantile Library building, 178 feet. It is four stories high in front and five in rear. The finer and lighter carriages are constructed here entirely. The division of the building into different shops and departments is even more complete and systematic than in the one just described. Every thing has been arranged with a view to the utmost convenience and facility, and all the various branches of the work go forward with the method and regularity of clockwork.

In the blacksmith shop, on the first floor, back, all the lighter carriages are ironed, and iron repair work is done. None but the best forged wrought iron is used, and experienced workmen do every thing carefully, by hand.

The west side of the second floor constitutes the wheel-shop. An unusual degree of thoroughness marks every portion of the work done in this room. The spokes and felloes are made of selected hickory, which has not only been seasoned in the rough lumber, but left to dry a long time in bundles, after being turned. The hubs are all made of gum wood, which is found by long experience to be the best adapted for the purpose.

THE TRIMMING-ROOM,

on the rear portion of the third floor, was a place of much interest to us. The work here begins to assume more the nature of a fine art. In this room the bodies are all upholstered, that is, decorated with the beautiful and costly cushions, cloths, patent leather, and laces which, in connection with their general finish, render the coaches of Mr. Rogers' make such marvels of elegance. The leather used here is all made to order, and most of the other trimmings are imported.

Adjoining, on the same floor, is the

PAINT-ROOM, FOR REPAIR WORK,

which is full of old broken-down coaches, buggies, gigs, &c., in various stages of disease and convalescence. Passing from this infirmary to the front room on the same floor, we find

MORE PAINT.

Here the bodies of new carriages are painted. The room is redolent of turpentine and varnish. Adjoining this on the west is a room the walls of which are covered with varnished paper, and the door of which is kept almost constantly locked. In this mysterious paradise of neatness—which, however, is not at all similar in odor to a paradise of flowers—the coach bodies are given their finishing coat of varnish. The divinity of the place did not happen to be varnishing at the time, and so kindly opened the door and suffered us to enter his sacred and odoriferous precincts. Even the remarkable cleanliness of the place could not reconcile us to more than a very brief stay, and we hastened on to admire other beauties.

EIGHTEEN COATS OF PAINT AND VARNISH

are necessary to produce the brilliant color and polish for which the Rogers carriages are noted. The fourth floor front is a storeroom for bodies which have been ironed and await trimming. Passing up out of this we were conducted over a portion of roof, which is made to do duty as a drying yard, and was covered with a number of running gears freshly painted.

From the rear end of this roof we entered the fifth story, back, which is used as a paint-shop for the running-gears of new carriages. Adjoining this are more varnish-rooms. On the same floor is the

FINISHING-ROOM,

in which all the parts are collected and fitted together previous to being lowered into the warerooms for delivery to customers.

These warerooms, which we have already mentioned, absorb a large portion of the first and second stories, fronting on Chestnut street, and are constantly full of coaches, carriages, buggies, phaetons, drags, and light wagons of every known style and description, except clumsy and inferior ones. But we need not waste words in describing the contents of these attractive rooms. There is probably not a Philadelphian who ever promenaded that portion of Chestnut street without turning to admire the beautiful carriages which stand tantalizingly near the front.

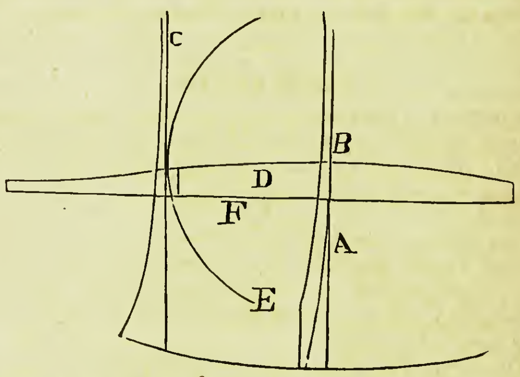
HOW IT WAS DONE.

The secret of Mr. Rogers' success may be summed up in a very few words. In the first place, he was perfectly familiar with the practical requirements of the business. He knew that the qualities requisite in all stylish vehicles are lightness and beauty of form and finish, combined with the greatest amount of strength and durability possible. Mr. Rogers studied to accomplish this desirable combination, and with what success the fame of his work attests. This high degree of perfection, however, is only attained by using the very best, and consequently the most expensive, materials, and by giving his personal supervision constantly to all departments of his great establishment.

CONSTRUCTION OF CARRIAGE DOORS.

BY P. B. J.

There is one very great mechanical imperfection attending the construction of carriage-doors, at the point where the lock-pillar meets the body, caused by lack of proper knowledge on the part of the body-maker, in giving to those parts the proper bevel. The result of this mistake has frequently been observed by practical workmen, and the mass of consumers generally. Often before the carriage leaves the factory it is found that the doors cramp, being with difficulty closed, owing to the inside edge of the lock-pillar coming in contact with the outer edge of the rabbet-pillar, or the one against which it closes, and many a foreman has committed the (not unpardonable) sin of "words both loud and deep," on being compelled to take his door plane, and chip off the inside edge of the lock-pillar, after the carriage is completed. To obviate all this perplexity we give a simple rule. We are quite sure that many of your readers will thank us for the information.



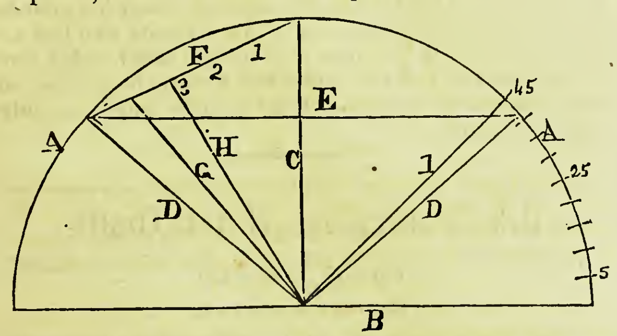
Take a pair of large dividers and place one point on line A at B, and the other touching line C where D crosses it, and make a circular line E. This line shows us the circle a door will make, no matter what its width. Therefore, where line E crosses line D we see what bevel the lock-pillar and the rabbet-pillar should have, which can be obtained from the inside edge of cant-board F. By this system we take a certain portion of wood off of the inside of the lock-pillar, and an equal proportion off the outside of the rabbet-pillar, and thus both receive the required bevel, according to the width of the door, and in harmony with the rotary motion thereof.

WHEEL-MAKING.

The proper selection of timber is a very important consideration in the making of wheels. The hubs should be examined carefully, and such ones selected as present the most even grains and as nearly alike as possible. Many hubs can be found in the market which are hard and glossy on one side while the other side is soft and brittle. Then, too, very often there are dark streaks passing along around the hub between the grains, these cannot be detected in the log, but they may be after they are turned. If they are found outside of the end bands, the hub should be rejected, as the grains are very apt to open at these places. Hubs should never be turned out of the green log, they should first be blocked out and bored, and then allowed to season. As soon as possible after turning they should be mortised and placed in a good loft to dry. The mortise should never be made the full size required, as the seasoning of the hub or the springing of the chisel, when mortised, will render it necessary for the mortise to be trued before the spoke is driven into it. With some wheel-makers the idea of a machine-made mortise not being true is considered the height of ignorance or folly. And it does seem inconsistent to suppose that a well-constructed machine should not make each mortise alike, and they may do so, but our experience has been that every mortise in a hub that was allowed to season after the mortises were made needed more or less trueing before the spoke could be properly driven. We are disposed to attribute this in great part to the shrinkage of the timber. For all light hubs select good white elm; the red elm is much used, but it answers better in large than small hubs. Locust hubs are the next best, they are, however, too hard to hold the spoke well, but when wheels are sold without painting they look very attractive. Oak should never be used for a hub that is less than eight inches in diameter; for this size and upward they are serviceable and are generally better liked than other kinds. They require much care in driving as they will split more readily than the white or red elm.—*Harness Journal.*

"STICK SEATS."

As "stick seats" are coming in vogue again, perhaps it will not be improper to revive an old rule, which, though *old,* has stood the test and proven itself equal, if not superior, to some more modern plans.



First, draw a half circle AA any given size, after which draw base line B, and then the square line C; then set your bevel to any angle you desire to give the mortise in your seat-frame, and draw line DD from the center of base line B, after which draw line E from the points where DD touches the circle AA; then draw line F. Next take your compasses and let one point rest on line C where it meets circle AA, and set them so that they will be just one-half the distance between the line E. and circle AA on line C. With your compasses thus set, place one point on circle AA, where line F and D intersect, letting the other point rest on line F, which shows you the exact location of line G. You will next let one point of the compasses rest on circle line AA where C intersects it, and the other on line F, and prick off three spaces, 1, 2, 3, and the point of the third space gives you the location of line H, after which you are ready to apply your rule to the work. Remembering that line D is to lay out the mortises in the seat-frame by, line G to cut the shoulder on the corner-pillars, and line H gives you the bevel to dress your corner pillar, line I of 45 degrees constitutes a square mitre. The above is the most complete system for framing "stick seats" we have ever seen, and every body-maker will be benefited by adopting it, especially those who have been working on the old "try and fit" plan. P. B. J.

WHY TIMBER IS PAINTED.

When water is applied to the smooth surface of timber, a thin layer of the wood will be raised above its natural position by the expansion or swelling of the particles near the surface. In colloquial phrase, workmen say that when water is applied to a smooth board, the grain of the timber will be raised. Every successive wetting will raise the grain more and more; and the water will dissolve and wash away the soluble portions with which it comes in contact. As the surface dries, the grain of the timber at the surface, having been reduced in bulk, must necessarily shrink to such an extent as to produce cracks. Now, if a piece of oil-cloth be pasted over the surface, the timber will be kept quite dry. Consequently, the grain of the wood will not be subjected to the alternate influences of wet and heat. As it is not practicable to apply oil-cloth ready made, a liquid or semi liquid material is employed for covering the surface, which will adhere firmly and serve the purpose of oil-cloth in excluding water that would otherwise enter, to the injury of the work. Metallic substances are painted to prevent oxidation or rusting of the surfaces which may be exposed to moisture.

It is of primary importance to make use of such materials as will form over the surface a smooth and tenacious pellicle, impervious to water. Any material that will not exclude water sufficiently to prevent the expansion of the grain of the timber, or the oxidation of metallic substances, must be comparatively worthless for paint. Linseed oil possesses the property of drying when spread on a surface, and forming a tenacious covering, impervious to water. Spirits of turpentine, benzine, benzole, and certain kinds of lubricating oil, all of which are frequently used in preparing paint, will not form a covering sufficiently tough and hard to resist the action of water; for which reason, the paint that is made by employing these volatile materials will be found comparatively worthless for outside work. A pigment is mingled with the oil to prevent the timber to which the paint is applied from absorbing the oil. The design is not to saturate the wood with oil, but simply to cover the surface with a coating resembling a thin oil-cloth.—*Manufacturer and Builder.*

THE PAINTER'S SECRET.

In the days of old, in the days when painters lived to paint—not painted to live—when they were the missionaries of art, not the tradesmen; sacrificing for its sake fortune, friends, country; braving for its sake the curse of parents, the tyranny of despots—in such days, Domenico, a pupil of Van Eyck, opened a school of painting in one of the large towns of Italy.

Despite the arduous efforts of other teachers to excel him and to induce the patronage of the wealthy and noble, Domenico had gathered under his tutelage representatives of some of the noblest families in the dominion.

Though deficient in truth, originality, and simplicity of the thought that characterized the earlier masters, yet the secret of giving permanency and durability to his coloring had raised him far above all his cotemporaries. He alone knew that mixing *oils* with his colors fixed them upon canvas, and preserved them for posterity, while those of every other painter, from their want of consistency, either fell off in drops while wet, or in scales when dry. Consequently he was the painter most in vogue.

This secret Domenico had learned from his master, Van Eyck, who had bequeathed it to him on his death-bed; and he had resolved to do the same for his young and brilliant pupil, Castano, when called away from earth. The young Castano possessed a wonderful strength and freedom of pencil, and already he needed nothing but his master's secret to surpass him as well as his fellow-pupils. Often had he watched Domenico at work; often had he supplicated him, fervently, and pledged to him the devotion of his whole life if he would but impart to him the talisman.

"At my death," the inexorable master would say; "and not till then."

One morning, when all Domenico's pupils were assembled, and discussing, as was their wont, their master's secret, Castano sat by himself in a corner of the painting-room, buried in deep thought. It needs must be some subject of deep and momentous import that could thus absorb the whole man. His pencil had dropped from his hand, and he heard not what was passing around him. Castano's thoughts were of himself and all his comrades, kept in obscurity, debarred from fame by the selfish reserve of one to whom they were, for the most part, superior. With his secret, what far nobler service than he would they be capable of rendering! Would not any means be lawful to wrest the secret from him and make it their own? Any means! The motion of his hand, instinctively feeling for his dagger, and the convulsive contraction of his brow, awoke him to the consciousness of the full import of his meditation; and at that moment Domenico entered the room, with the already dry design of a new picture.

All the pupils gathered around him, Castano only excepted, who remained in his place motionless as a statue, with his eyes fixed on the master, while every one else was gazing on the picture.

"By the chin of St. Agatha!" exclaimed Domenico, "I have surpassed myself! This rough draft is admirable in its coloring. Look! you may rub your hand over it —sponge it! See! I pour water on it, I spit on it, and it is only the more brilliant! Well, I was obliged to wait a long time for Van Eyck to die, and you must be patient, too. I have made my will, Castano, and there you will find the secret."

Was it the force of the electric thrill through his whole frame at these words, that impelled Castano forward till he stood face to face with Domenico? He stood gazing sternly, fixedly upon his master, as if he would penetrate his utmost soul to drag thence the secret.

The next moment Castano was on his knees, with clasped hands and suppliant tones, pouring out tears and prayers, imploring him to have pity upon him and upon the others—nay, upon the art itself. He abjured him to have mercy upon him; not to press him too far; not to deliver him over to the fatality that he felt hurrying him along.

"Mercy!" again and again he cried, "mercy on these men—on me—*on yourself!*"

This tempest of passion was utterly unintelligible to them all. The other pupils, who had been examining and seeking the mysterious coloring with fingers, and eye, and tongue, now gathered around him; while Domenico stared at him, half-thinking he must have been seized with a sudden fit of insanity. The next moment he coldly repeated his unalterable determination never to reveal his secret during his lifetime.

That very night, under murky clouds and a starless sky, a man, wrapped in a dark mantle, made his way, with the stealthy steps of a lover, in the direction of Domenico's house, at the top of a long and narrow street. The slowest-paced clock in the city had struck the hour of twelve, but the man in the dark mantle was still waiting and watching.

At length the figure of a second man was seen approaching from the other end of the street. He was singing as he came along. It was too dark and too late not to sing.

At the sound, the first comer hastened forward, then stopped as the other drew nearer and nearer. When they were quite close to each other, the cloak was thrown back, and something flashed from under its folds.

Suddenly a cry was heard—"Murder! help! help!" Then came the sound of a body falling heavily. There was a deep stillness for a few moments, and then was heard the distant echo of footsteps in rapid flight.

The first cries of the victim having roused the inhabitants of the street, a number of persons soon crowded about him, and recognized in the mortally wounded man their neighbor, the celebrated painter, Domenico. A surgeon was soon on the spot; but the painter, feeling that he had received his death-stroke, refused to have his wounds dressed. Ordering some one of his servants who had arrived to hasten to his house and bring a small casket containing his will and the unfinished picture, he insisted on being carried to the house of his favorite pupil and only friend—Castano.

(*To be continued.*)

Pen Illustrations of the Drafts.

FULL-SIZE LANDAULET.

Illustrated in Plate IX.

These carriages, now quite popular with the aristocratic portion of our citizens who frequent the drives of the Central Park, make a superb vehicle for two passengers and a good show on the road, especially with the circular front, and upper portion of the door removed. Hung-off as this is on combination springs, it makes an easy and comfortable riding carriage, seldom surpassed. Width of the body (in the clear) measured between the hinge door-posts, 50 inches; axles, 1¼ inches; wheels, 3 feet 4 inches and 4 feet; hubs, 4¼ by 7 inches; spokes, 1⅛ inches; rims, 1¼ inches deep; tires, 1¼ by ⅝ inches.

Painting.—The body, English patent black; the carriage-part, crimson-lake, gilt stripe.

Trimming.—Brown satin.

Workman's price for making body, $150; for making under carriage, $22; manufacturer's charge for the finished carriage, $1,600.

New York Charges for Repairs.—*Wood-work:* Hub, $5; new spoke, $1; rimming wheels, $20; half-rim, $2.75; drafting wheels, $1; furchel bed, $10; bolster, $8; back spring-bar, $9; horn-bars, $8; fifth-wheel bed, $2.50; splinter-bar $3; pole, $10. *Iron-work:* New iron tires and bolts, $38; resetting tires, $8; tire-bolts, 25 cents; carriage-bolts, 30 cts.; resetting axles, $10. *Painting:* Burning off old paint and repainting, $175. *Plating:* capping axle-nuts, $6; silver-bands, $6; door-handles, $8 to $10.

CABRIOLET CALECHÉ.

Illustrated on Plate X.

We are favored with this design for a Cabriolet Caleché through the courtesy of Messrs. Brewster & Co., of Broome street, New York. The simple mention of the firm with whom it originated will be a sufficient recommendation for the drawing, without any commendation from us. Width of the body in the clear, 48 inches; axles, 1 inch, large; wheels, 3 feet and 3 feet 10 inches high.

Workman's price for making body, $75; for under carriage, $20; manufacturer's price, $1,200.

Prices for repairing about the same as for the full-size Landaulet on Plate IX.

EXCELSIOR PARK PHAETON.

Illustrated on Plate XI.

This design originated with one of our own artists, and is a capital thing either for a private family, the watering-places, or for hacking purposes. It has a decided advantage over the "chat-a-banc" class of carriages, in which the passengers are obliged to sit sidewise, since all may here sit facing to the front. The body is a very plain one to build, and, therefore, requires no instruction to the builder from us. Wheels the same height and about as heavy as the last. Price of the carriage, about $500.

COMPOUND BUGGY.

Illustrated on Plate XII.

We call this a compound body because it is made up of at least two others, and should it possess no great beauty it certainly is a novelty. The mechanic will see that it is not difficult to build it, being nothing more nor less than the old coal-box buggy, moulded off in a *new* fashion. Price, $450.

ROAD PHAETON.

Illustrated on Plate XII.

This drawing represents a road phaeton of very chaste design, which we trust will meet the approval of our readers. It is a very plain carriage to build, and will look well when built and run on the road—an advantage not always obtainable from following paper drawings. The stick seats make the carriage look much lighter than when close. For an open carriage, in fine weather, this vehicle is well adapted. Width of the body about 45 inches, the seats projecting over the sides 1½ inches at each end; wheels, 3 feet 10 inches and 4 feet high; hubs, 3½ by 6½ inches; spokes, 1 inch; rims, 1⅛ inches; steel tires, ⅝ by 1 inch. Price of phaeton, $525.

New York Charges for Repairing.—*Wood-work:* Hub, $5; spoke, $1; running wheels, $18; drafting, $1; axle-beds, each, $4; perch, $5; head-block, $3; spring and shaft-bars, each, $2; shaft, $4; pole, $9; yoke, $7.50; fifth-wheel bed, $2.50. *Iron-work:* New tires and bolts, $20; tire-bolts, 25 cents each; carriage-bolts, each, 30 cents; an elliptic spring, $16; new fifth wheel, $5; resetting an axle, $6. *Painting:* Touching up and varnishing, $45. *Trimming:* Leathering shafts, $6; re-covering dash, $10; new apron-(rubber), $10; whip-socket and fixtures, $3.

Sparks from the Anvil.

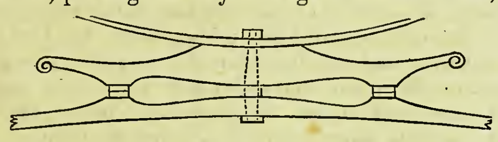
BESSEMER STEEL.

The question of steel *versus* iron is one of vital importance to the coach-maker; and we have taken much care in preparing the following article, which compares in detail the qualities of the Bessemer steel with those of iron. Steel tires have already become the standard illustrating the value of this metal over the old iron tire, and we believe the time is not far distant when steel will be used for every purpose in coach-making where iron is now employed.

The pneumatic or Bessemer process of making iron and steel consists in forcing into a mass of molten pig-iron, contained in a suitable vessel called a converter, streams of air under a high pressure, and, by the combination thus effected between the oxygen of the air and the carbon in the iron, decarburizing the metal entirely, and then in adding to the metal under treatment, after it has been entirely decarburized by the blast of air, a certain percentage of a triple compound of iron, carbon and manganese, which is found as an article of commerce in the Spiegeleisen of Germany, and the Franklinite pig-iron of this country. And by varying the quantity of this compound, which is to be added in accordance with the percentage of carbon which is known to be contained therein, any required degree of carburization can be given to the metal under treatment, while the manganese in the compound, acting as a detergent or cleansing material, removes or neutralizes the oxides, sulphurets and phosphurets existing in the metal, which would otherwise render the product red-short or cold-short and useless. The conversion of the molten metal by this process is a very rapid one, 30 minutes being the longest time required for converting ten tons of the grayest pig into steel or soft iron, ready to be cast into ingots or masses of any desired form. The average duration of the blowing operation is from fifteen to twenty minutes. The present practice is to provide an engine large enough to take in from 1,000 to 1,200 cubic feet of air per minute, per ton of iron intended to be treated, the pressure to which it is condensed before delivery varying from 12 to 20 pounds per square inch. The pneumatic or Bessemer process, thus briefly described, is one of the simplest, perhaps the very simplest, in metallurgy. For, although the apparatus required for its successful conduct is somewhat complex, it is not difficult, and the skill and experience needed to produce it with ease and certainty may be acquired in much less time than to puddle iron well. The apparatus for manufacturing under this process consists of a blowing-engine for compressing air and forcing it through the molten metal, a cupola-furnace for melting the pig-iron, another small one for melting the Spiegeleisen, Franklinite or other carburizing and purifying material, and a pair of converting-vessels into which the pig-metal is run. The magnitude of the apparatus is governed by the amount of business to be done, and the size and character of the castings it is desired to produce. The blowing-engine is the most important as well as the most expensive portion of the apparatus. It must be large enough to treat the greatest quantity of iron it is intended to convert at one operation. The cranes and the apparatus for tipping the converters are operated by hydraulic power, communicated by a suitable force-pump, working at a comparatively low pressure. Production by this process is very rapid, and from four to six conversions can be conducted each "turn" of ten hours with each pair of converters. A five-ton apparatus will produce from 20 to 30 tons of ingots of iron or steel every "turn" of ten hours for each pair of converters employed. The practical value and peculiar characteristics of the Bessemer metal are best shown in the great variety of applications which have been made of it to uses requiring the best material obtainable. But in order to give the clearest idea of the qualities of this product, as well as to answer the most common questions asked concerning it, we will consider the steel with reference to the following leading peculiarities of the metals with which it has to compete: Its purity.—From the nature of the process (the impurities in the iron treated being thoroughly oxydized by the streams of air, and expelled as gases, or thrown off as slags, by the violent eruptions produced by the chemical and mechanical action of the blast on the charge), the product, as left from the conversion, is purer than similar metal refined by any other method. Its homogeneity.—The pneumatic or Bessemer metal being maintained in a fluid state throughout its conversion from the pig iron, is cast at once into perfectly sound and homogeneous ingots or masses of any desired size; whereas wrought iron, whether made by the bloomery or puddling processes, being only an aggregation of the granules of metal which are developed in said processes, cannot be produced thereby in large masses, but the comparatively small and imperfect blooms or bars so produced, must afterward be welded together for forgings of even moderate size; a treatment which, even under the most favorable circumstances, and with the best skill and care, fails to give perfectly sound and homogeneous products. Fiber is never shown by this metal in any stage of its manufacture. Indeed, a pure metal cannot be fibrous; and the old dogma that fiber is a necessary concomitant to strength and toughness has long ago been shown to be an error. The absence of this quality from this metal renders it peculiarly fit for many products. Its hardness, as has been already stated, may be of all the various degrees between a thoroughly decarburized, soft and weldable iron, and a well-carburized steel; but this metal never, while untempered, manifests the peculiar brittle hardness of the high grades of crucible steel. It is compact, firm and uniform, possessing, when most fully carburized, enough of the hardness of the ordinary cast-steel to meet many of the practical needs in that respect, and yet with other qualities which render it applicable where a metal simply hard would not answer. Rails made from this product have been proven to be more than twenty times as durable as the best quality of iron rails, and tires of the same material last very much longer than the most celebrated makes of iron tires. Toughness is one of the most prominent characteristics of this product, and no iron or steel made by other modes can be compared with it in this respect. It is this quality, combined with its moderate hardness, great strength and stiffness, which makes the Bessemer steel so suitable for use upon railroads. The idea entertained by many persons that exposure to a low temperature will cause the metal to become brittle, is unfounded. In fact, it has been well settled, by experience on Russian railways, that mild-tempered steel, such as is generally used for axles and tires, is not so liable to be altered in its molecular arrangement by frost, or by jarring wear, as are the best brands of fibrous iron. The strength and tenacity of Bessemer metal varies, of course, with its character. The metal is strongest in the most highly carburized condition in which it is malleable, and its strength decreases gradually as the percentage of carbon is lessened. Tests of this product made at the Woolwich Arsenal, in England gave the unhammered ingots a range of tenacity from 41,412 lbs. per square inch for the average of the iron, to 60,031 lbs. for the average of the steel ingots tested. While tests of the hammered and rolled products gave an average of 72,643 lbs. as the strength of the soft iron, and 153,677 lbs. as the strength of the hard steel bars per square inch of section; and any grade of metal between these limits may be produced by this process. The ductility and malleability of this product are, like its toughness, very great; and combined with its toughness and tenacity, they render the metal superior to all others for crooked and difficult forgings. *The pneumatic or Bessemer product may be subjected to any mode of treatment or working to which malleable iron or steel made by other methods is commonly exposed*, as it can be made to possess all the good qualities of both of those metals without having the imperfections of either. The welding of this metal, either to itself or to ordinary iron, can, even when the metal is well carburized, be effected readily, with reasonable care on the part of the workmen. The articles now most generally made from the metal produced by the Bessemer process are *rails* (of which more than 100,000 tons are now annually rolled in Europe), axles, tires, boiler and ship-plates, anchors, shafting, beams, girders, gun and rifle-barrels, forgings for locomotives, stationary and marine-engines, machinery of all kinds, and other products which require to be made of first-class material. In England, and on the Continent, the value of this metal for general use is now so well understood and appreciated that *the production of the works there for the current year will amount to nearly* 700,000 *tons*—a very rapid development, it must be conceded, of a manufacture which can hardly be said to have come into existence till the year 1860. The discoveries and improvements of Messrs. Bessemer seem to have sealed the fate of the catalan forges, bloomeries, refineries and the ever-troublesome puddling process, by which ores or pig irons have so long been advanced toward the finished product, for these improvements enable us to make a better product at the same or a less cost. In conclusion, it may be broadly stated that the metal is rapidly making its way into every department of the mechanical arts, including carriage-making, where, for all the nicest class of work, it has already displaced wrought-iron and crucible steel for most purposes; and when its advantages are understood, we believe that the revolution in iron will be complete, and in place of the iron age will be inaugurated the age of steel.

NEW KING-BOLT.

Many objections exist against the old-style king-bolt, one of which is that the head which is let into the head-block cuts away too much of the wood, and in time begins to wear away the wood and rattle, completely cutting off the perch, where the clip king-bolt is not used. I will explain a simple, yet excellent, mode of obviating the objections to the old-fashioned bolt, which the diagram will explain in full. Let the king-bolt be made tapering from the center both ways, with thread and nut on both ends, passing directly through the head-block, axle,



and spring. It is best to work a collar on the plate of perch and axle-plate on all jobs.

Keep.

Paint Room.

BRONZE COLORS.

Many attempts have been made to utilize mica and transform it into bronze color, and at last these experiments have been successful. Mr. Schwartze in London, Mr. Tiller in Vienna and Mr. Rotter in Amberg, Bavaria, already manufacture such a product in large quantities. Consequently a new field has been opened for employing mica.

To this end the mica is ground in a crushing machine, pulverized by help of a mill, boiled in humiatic acid, freed from what acid might cling to it, and at last assorted according to its coarseness by help of a strainer.. The scales of the mica, thus prepared and classified into four sorts, according to their size, have in commerce various names, as brocatel, crystalline colors, bronze of mica, etc.

These bronzes of mica possess many advantages. They contain no substance injurious to health. They have a metallic luster like the bronzes of metal, and oftentimes even surpass these in beauty of color. They are brown, black, blue, green, and even rose-colored; the latter of which is not found among the metallic bronze-colors. They are, furthermore, entirely proof against influence from sulphurous gases, a quality which the metallic bronzes lack. And as they resist very well the influence of light, and do not in the least change color, as the metallic bronzes, even when exposed to damp air, they do not require to be inclosed in expensive tin-boxes when exported. Their specific weight is very small, and as they cover a large surface, they are exceedingly economical.

They are very generally applicable, not only to fancy and household articles of metal, wood, glass, or plaster, but also in many other cases; for instance, in the art of painting, especially that of theatrical painting, in the art of decoration, in the fabrication of artificial flowers, of sealing-wax, and generally in all cases in which the metallic bronze colors have hitherto been used. Trials, however, of impressing them upon cambric muslin have not given a satisfactory result, because the scales of the mica are not sufficiently fine.

Before these bronzes are applied, it is advisable to cover the body with a ground-color resembling that of the bronze chosen. Thus the silver bronze should have an under-coat of white lead, the blue an under-coat of ultramarine, etc. If oil colors are used, it is necessary to employ binders. Yet, as with the metallic bronzes, before the application of the bronzes the coat must be dry enough in order to cease to be sticky. Bodies treated in this way obtain, especially after being varnished, a luster the beauty of which has never been surpassed.

The bronzes are manufactured with the following colors:

1. *Rose.*—The coloring matter is produced by a decoction of cochineal. This color is entirely soluble in hot water, in which case the mica will be discolored. The colored solution becomes blue, when ammonia and hydrochloric acid are added.

2. *Crimson.*—The color dissolves almost entirely in water. It is destroyed by adding ammonia, and becomes yellow by adding hydrochloric acid. A portion of the coloring matter dissolves in alcohol, which it colors red with a bluish tint.

3. *Deep red.*—Showing the scales brown-red. Hot water dissolves a part of this, and the remainder is left brown. Alcohol dissolves a brown-reddish matter, which, when ammonia is added, becomes reddish-yellow, and when hydrochloric acid is added, citron-yellow. The coloring matter is the Fluvana-brown.

4. *Violet.*—Water dissolves but a small portion of the coloring matter; water mixed with acetic acid dissolves it entirely. Ammonia discolors it. Hydrochloric acid colors the solution greenish. The coloring matter is the Flossmann green.

5. *Bright blue.*—The coloring matter dissolves neither in pure water, nor in acidulated water, nor in alcohol; it only dissolves in oxalic acid. Other effects are produced according to the way in which the Berlin blue is employed.

6. *Deep blue.*—Only a small portion of the coloring matter dissolves in pure water; a little larger portion dissolves in acidulated water, which it colors red-violet, The solution becomes entirely discolored by ammonia. and colored blue by hydrochloric acid. The scales of the mica remain blue and lose the rest of their color in alcohol; ammonia colors this solution violet, afterward red, and at last reddish; hydrochloric acid colors it greenish. The coloring matter seems to be an aniline blue.

7. *Bright Green*, and 8. *Deep Green.*—The coloring matter of these two bronzes does not dissolve in water, but in alcohol, and shows its effects by a mixture of aniline-blue and turmeric. If an alcoholic solution of the matter is prepared and some ammonia added, a brown-red residue is obtained, indicating turmeric.

9. *Blue violet.*—The coloring matter dissolves but little in water, not at all in alcohol, but entirely in hydrochloric acid which it colors violet-red. The coloring matter is mixed with the scales of the mica as with a fine powder.

10. *Clear blue.*—The coloring matter does not dissolve in water, nor in alcohol, acids, concentrated alkalies, or concentrated nitric acid. A microscopic examination proves the mica to be mixed with small quantities of pulverized indigo.

11. *Gold color.*—The coloring matter is but a little soluble in water, somewhat more in alcohol, indicating turmeric.

12. *Silver color.*—Pure mica without any color added.

13. *Deep brown.*—The matter dissolves better in water than in alcohol. A solution with hydrochloric acid, sulphate of iron, and acetate of lead gives a residue which proves the use of a decoction of bark.

14. *Black.*—The coloring matter of logwood dissolves in water and alcohol, which becomes yellow, and is used for shadowing. The mica remains deep blue colored, and retains a lake, which, when decomposed by oxalic acid, presents characteristics of litmus.

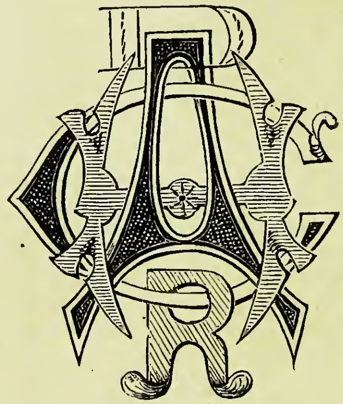
FLAT PENCILS.

To make a flat pencil for fine striping, split a piece of wood at the end, insert a layer of sable hairs, very thin and about a quarter of an inch wide, and bind with waxed thread. Use on the edge. These pencils are employed by many of the best painters for fine striping, and are decidedly the most serviceable for this purpose. They carry more color than the ordinary pencil, and allow of greater rapidity of work. An experienced painter can stripe quite a number of spokes, or even go clear around the felloe of a wheel, without replenishing the pencil with color.

MONOGRAMS.

MONOGRAMS are of very old date. As far back as we know of letters, we know of monograms too. They are found on Greek coins from the sixth century before Christ, and we know that the Scandinavian people used them even at an earlier time. Their pedigree is thus of honorable length, but perhaps its age is more noticeable than its blood, for there does not appear to be much glory in the history of monograms. It may come in the future.

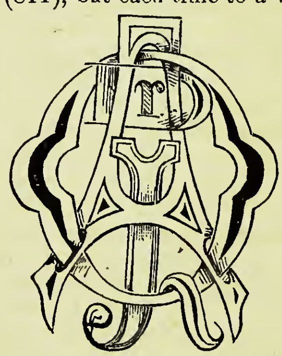
As to their origin it was very simple. When a name or a sentence was to be put down on a very small space, as for instance on coins and seals, it was common and very natural to reduce it by abbreviations to two, three, or four letters, and then interlace these letters with each other till they made a single character, small of size and easy to recognize, but difficult to understand, and therefore difficult to counterfeit. And thus, on the paternal side, monograms have, no doubt, originated as a sort of economy, a very respectable origin, indeed, but not very noble.



Dr. A. C. H.

With the Scandinavians, however, monograms do not seem to have been used in this way. They were with them rather a trick. When one had to send a message and dared not trust the bearer, he wrapped his news in a cloud of very obscure words, and put these on a wooden plate in a series of intricate monograms which only very apt people were able to decipher. Thus, his letter, though open to all the world, was covered with a double envelope, and its monograms were often its best safeguard. Sometimes monograms assumed to play the part of witchcraft. It was a common belief with the Scandinavian that certain characters when engraved on the sword-blade would make it cut through stones, or when taken in the mouth make the man invisible, or when thrown to the feet of a young girl make her love the swain who had done it, and in this way they are still used to some extent throughout Europe. Toothache, gout and other devils are still driven out of the peasants by help of mystical monograms written in the air or on the bed by the witch. On the maternal side, therefore, monograms have something romantic in their origin, though this romance seems to have an inclination towards the fabulous.

Since the origin of monograms they have been in particular vogue at two times; first, during the first period of the Christian Church, under the emperor Constantine the Great (325), and, secondly, during the first period of the middle ages under the emperor Charles the Great (811), but each time to a very different purpose.



Dr. J. Q. A.

The monograms of the time of Constantine were symbols. People were not satisfied that the initials of their names were nicely interwoven to make one symmetrical character. They required that this character should symbolically indicate some high and valuable idea characteristic of their own life, or at least of their ambition, and the cipher was thus formed as a cross or an anchor or a heart. All know, for instance, the monograms of Christ's name with which Constantine stamped his coinage. It was used until the time of Theodorus Lascaris. This passion for symbols, in which the monogram originated, was neither a whim nor a fancy, but a deep and true feeling, and it soon found a material richer and more suited to its purposes than the poor monograms. These had to yield to their younger and more splendid cousins—the nobleman's coats of arms—and thus the former disappeared in utter darkness for some four hundred years.

Next we meet them at the court of Charles the Great. To what did he use them? Well, he was a great man, and knew very well how to do justice to every man and every thing. From Cæsar to the French revolution the world had received no political impulse greater than that it received from him, and, besides his greatness, he was a good man, of serene moods and refined domestic manners. But he lacked one valuable accomplishment. He could not write. Equihard tells us how patiently the old Kaiser sat down to his tablet, trying and trying again, but his fingers, which could hold the scepter and the sword, could not hold the pencil. He only learned to write one single character, the monogram of his name. And as the Kaiser did, so did the bishops. Le Blanc tells us that many of the bishops of that time could not write, and neither could the greater part of the knights or any of the lower classes. There were no printers, no mails, no paper, no ink, and of what use, then, could it be to learn writing? It was enough to learn to write one's own name below a document, and in order to do that one learned to write it in a monogram. Thus the monograms lived even to this very day, as children of ignorance and substitutes for the difficult art of writing.

In our time they have received a new being in republican America. The wealthy man is pleased to have his name painted in a splendid monogram on the doors of his coach, and the lady likes to have hers embroidered on the corner of her handherchief. It is, so to speak, a revival of monograms, and who knows what the issue will be? Perhaps it is a step in the direction of an ingenious discovery. C. P.

CRESTS.

The ancient warriors wore crests to strike terror among their enemies, at the sight of the spoils of animals they had killed, or to give them the more formidable mien by making them appear taller. In the ancient tournaments the cavaliers had plumes of feathers, especially those of ostriches and herons, for their crests; these tufts, which they called *plumarts*, were placed in tubes on the tops of high caps or bonnets. Some had their crests of leather, others of parchment, pasteboard, &c., painted or varnished to become weather-proof; others of steel, wood, &c., on which was sometimes represented a member or ordinary of the coat, as an eagle, fleur de lis, &c., but never any of those called honorable ordinances, as pale, fesse, &c. The crests were to be changed at pleasure, being reputed only as arbitrary devices of ornaments. Herodotus attributes the rise of crests to the Carians, who first bore feathers on their casques and painted figures on their bucklers, whence the Persians denominated them cocks. The Etruscans were also famous for their crests, and modern artists have given similar additions to the helmets of the three Horatii. Golden crests were worn by knights seeking the smiles of their fair ladies.

Copal Varnish was first discovered and compounded in France, and was long known by the name of "*vernis martin.*"

CANARY YELLOW.

Canary Yellow comes in crystallized pieces, and is of so very gritty a nature that great care must be exercised in preparing it. It cannot be ground in oil nor in the mill, but must be ground on the stone, and water is added to help in cutting down. After being ground very fine, the water is worked out as in the process above described, or it may be spread on a sheet of glass and the water evaporated, and oil is then added as with ordinary colors, and it is applied in the same way.

Trimming Room.

TRIMMING OF CARRIAGES.

Like pictures, the trimming of carriages is seldom beyond criticism. This may be from reason of execution or of assortment of shades. A blue trimming is always the easiest to arrange, because the shades of this color vary but little, all the dyers using nearly the same coloring matter. Quite different it would be, if the coloring matter were obtained by mixing several colors, as, for instance, the shade of tobacco which is obtained by mixing two, three, four and even five different colors: yellow, orange, Van Dyke brown, ivory black and Japan. In the latter case it would be very rare—for it would be the effect of chance—if two dyers used the same matters in exactly the same proportions. As the cloths, the reps, and the moroccos are all colored by different makers, there will consequently always be a more or less conspicuous difference in their shades, and this difference in shade is always discordant. Studied and elaborate trimmings are in vogue in France at present, especially for open carriages. The descriptions of them, which are given by a French paper which we have before us, show the style to be much more showy than is the style here. Indeed, the present style of trimmings used in New York is plain, even *very* plain, and we are glad to see it so, for we consider it much more tasteful. We are thus enabled to avoid those many differences of shade which we have mentioned above, and which are so distasteful oftentimes.

STYLES IN LONDON.

We learn that the most stylish broughams which have lately been turned out in London are lined with black satinet. The laces are rather plainer than the fashion has been, and are stitched with a line of gold-colored silk. This quiet trimming is made to correspond with the painting, which is also very quiet—the body and carriage-parts being black, the former having no fine lining and the latter only a narrow picking out line of gold.

A rubber slide for coach doors has been contrived by the English which is very convenient. It works thus: An india-rubber roller is let on to the edge of the glass frame, working freely on its center, and it is made sufficiently large to produce a pressure within the grove, whenever the glass frame slides up. It prevents rattling and allows the door to be fixed at any elevation. Another neat contrivance is facing the inner surface of the door style (where the glass frame runs up) with plate glass. The style behind the glass is painted in the usual manner; and thus protected, it always presents the appearance of newness.

Editor's Work-bench.

HOW TO ACQUIRE TASTE.

The valuable paper which follows has been written for us by a "magister artium" of the University of Copenhagen, and in giving it to our readers we trust they will appreciate its importance, as bearing directly on the elevation of coach-building to that high point where it belongs. We hope they will study it carefully. The writer deals with coach-building as *an art*, and applies the same principles as he would to the latter. He urges that taste is a most important characteristic of the successful builder of the best coaches. Such is most surely the fact, and taste in the coach-maker becomes more and more indispensable as the art of coach-building advances and improves, and the taste of the public becomes educated and refined. We feel that no coach-builder can read this article without feeling that his labor admits and demands taste, and that it is for his best interests to apply his appreciation of taste to all that he works upon.

HOW TO ACQUIRE TASTE.

Shall the carriage wheels be large or of small diameter? Shall they have broad or narrow tires? Shall the body of a coach be hung on a level, as generally done now, or the front half an inch higher than the back, to make a more comfortable seat, or with the back half an inch higher than the front, to give the vehicle an easier speed? All of these are questions of *utility*, not of *taste*, and they are to be answered according to the dictations of usefulness, without the slightest regard to fancy, but after all problems of utility are solved, and a carriage of thorough usefulness planned, taste ought to be the guide of the workman in applying them. *Utility directs what is to be done, but taste should direct how to do it.* For most any thing can be done in a thousand different ways, but *no two ways of doing things are equally good, to have the power of choosing the best, is to have taste.*

Taste relates only to appearance. People, therefore, who know that *it is more to be than to seem,* and who have experienced that appearance is often nothing but show, are not likely to think much of taste, nor to care much about acquiring it. But it would not be difficult to prove, that the appearance has an important influence upon the thing itself; and, consequently, taste is essential. But there is no need of a philosophical demonstration. The man who sells will soon learn by his pocket that a good appearance is half the market value of every selling thing, not only of luxuries, but even of substantials, and he will learn, at the same time and of the same instructor, to appreciate the value of that mental acquirement which enables a man's workmanship to be *not only good, but good-looking.*

With coach-making, taste consists in arranging the outlines to please the eye and call forth from the mind only pleasant ideas—for instance, ideas of ease, comfort, elegance, lightness, speed, &c. As the body and the parts of a carriage comprise a large number and variety of very different lines, circles of different diameters, curves of different bendings, straight lines cutting each other at different angles, &c., it is a matter of taste, and a difficult one, to combine all these different lines into a harmonious whole. There are lines which must look as if they were running on infinitely, only melting away little by little into other lines. If intersected roughly, or in any way broken, the effect is disagreeable. Other lines require to be cut directly, and if not so cut, they lose strength and distinctness, look clumsy, and produce strange and unpleasant ideas. Thus, every kind of lines must be treated according to its nature. The difficulty of combining two lines, one of which requires to be cut sharply, while the other requires to be absorbed gradually, has been felt by every coach-maker, in planning a proper connection between the coach-box and the coach-body. How often does the coupé look like a dungeon-cell, or the landau like a goose-nest, and the phaeton like a plate presenting young ladies as if they were visiting-cards, and thus, because the outlines of the carriage are without taste. On the contrary, many a heavy vehicle looks light and elegant, because the coach-maker has understood how to lift and vivify the mass of its body and gears with fine and graceful lines.

The question now arises, how is this useful and almost indispensable science, which we call taste, to be acquired? If taste were really a science, the school would have to teach it; but it is not a science. *It is partly a natural gift and partly a mental acquirement. It is a faculty born with us and growing almost unconsciously during the whole education.* The school can do but little to give it. Taste must be earned. What the school and the public can do towards cultivating it is, first, to carefully avoid propagating a false taste, and, second, to afford the means by which true taste can grow. Drawing is generally considered as one of the best means to acquire taste in respect to lines, and hence drawing has been made a part of the mechanic's education. This is a good step. There is, indeed, nothing else which makes a man understand more easily the importance of lines and enables his eye to discriminate so easily the nature and signification of different lines. Drawing, therefore, ought to be a part of all education. Besides educating the sight, drawing is valuable by enabling us to set forth our ideas on paper, to communicate them to others; but of itself it cannot furnish us with ideas, nor can it give us any advice as to the forming of proper ideas. The very best step towards becoming quick and fertile in inventing lines which produce a lively, graceful and expressive appearance—and this is what the coach-maker aims at—is to study the two *linear arts,* as they might be called, sculpture and architecture. The coach-maker, therefore, who wishes to work not only with his hands but with his head, should go often into the galleries where the best specimens of sculpture and drawings are exhibited. In the Greek statue he will study the running and infinite lines, and in the Gothic dome the broken ones, and in their most consummate applications, and his imagination, if once impregnated with these forms, will never degrade itself into expressing clumsy or unpleasant forms. In the smallest work he devises there will be an indescribable something which always pleases and charms. He will make the heavy look light, and the light look solid; and he will always work out something graceful, although fulfilling the most singular demands of his customers.

Sculpture and architecture are, indeed, the school to which the coach-maker must go in order to acquire the most elevated taste. There is room in one article to give but a slight idea of the various lessons which both of these arts are able to give the mechanic. In the present paper, therefore, we will speak of the influence of sculpture only.

First, there must be made a distinction. It is not taste *for sculpture* which the coach-maker needs to seek after when studying statues, but *taste of lines.* This difference may be made clear by example.

The three most eminent statues of Venus are the two antiques, Venus from Milo and the Medicean Venus, and the modern one by Thorwaldsen. These are three great master-pieces.

Venus from Milo is Greek, and represents the time when the Greek people stood highest, morally and mentally. She is the grandest ideal of true womanhood ever conceived; soft as the wave, sweet as the sunlight, yet so dignified and lofty as to abash most wooers. She is heroic. The Greeks considered it the utmost disgrace to lose the shield in battle. A warrior who surrendered his shield, surrendered himself a slave disdained by his countrymen, while the slain hero who had fought bravely was borne upon his shield to his grave amid songs of praise. Well, if this Grecian Venus had a son to send to the battle, she would reach him the shield, and tell him to come back "with it or upon it." The Medicean Venus is Roman, and represents the time of the emperors, when Nero burnt up half the city of Rome to see how such a conflagration looked, and Heliogabalus harnessed eleven thousand young ladies of Rome to draw his triumphal chariot through the streets. She is still softer and sweeter than Venus from Milo, but without dignity. She still is the goddess of beauty and love, but she has been harnessed to the triumphal chariot of the emperor's lust. She has lost that shield behind which beauty and love must be sheltered or upon which they have to die; she has lost the purity of her mind. She can still be loved, but she herself cannot love; she is coquettish. Thorwaldsen's Venus represents our time. She is soft and sweet and pure also, but she is no goddess. She is not at all coquettish, but she is as little heroic. She is a modern woman, in spite of the ancient myth arrayed around her. She meditates—and I do not know but some difficult words of the Bible about the reverence of the wife to her husband or a speech of Miss Anthony about woman's rights may be the subject of her meditation. At all events, the apple she holds by her hand is not that which Paris gave Venus on Ida; it is rather that one which Eve reached Adam in the garden of Eden. To feel the eminent beauty of these three statues, and understand the difference of their beauty; to see the soul that unveils itself through each of these three figures, and read the different ideas which different ages have manifested in their bosoms, is to have taste of sculpture. But this is of no practical use to the coach-maker.

But let us examine these statues with another object; namely, to study their lines. Let us step around one of them slowly, and with eyes fixed upon the outlines, marking how they change. No line can be pointed out as beginning or ending at any distinct point, as can be done with the lines of a house. They are infinite, like the lines of a ring. Neither can any of them be construed as a circle or oval or spiral, or suggesting any geometrical or mechanical form. They are living. Like a stream, they run through all possible curves. This has a peculiar effect, and at last it will seem as if it *were not you* moving but the lines of the figure which begin to move and become living before your eyes. When we are able to feel the effect of these lines, and understand their meaning, we have acquired a taste for lines, and if our imagination directs the head in drawing a line, thereafter we will instinctively imitate them and produce a similar effect. This faculty is of the utmost importance to the coach-maker. Two carriages may be made of the same materials, and with equal skill and attention, and they may be equally heavy, yet one may be made without any sense of the influence of lines, and look as if it required four elephants to move it, while the other has been made with consummate taste, and looks as if it would run of itself. Which of these two carriages is the best? And which will pay best?

History proves by many instances the ennobling influence upon the mechanic of the study of sculpture. Thorwaldsen was undoubtedly the greatest modern sculptor. He was a Dane, and lived partly in Copenhagen, partly in Rome. As he grew old he drew up his will, and being a bachelor, he made the city of Copenhagen his heir. After his death, the city raised a monument in honor of him, and, from its sublime idea, it is grander and more beautiful than any other in the world. A large, square building was raised over his grave as a mausoleum, and in it were placed all his works, from the smallest sketch to the most elaborate bas-relief. Thus the very thoughts and deeds of the man, the ideas born of his soul and the works of his hands stand upon his grave to be admired and to be imitated by the world. A crowd of people throngs these halls whenever opened, and to visit Thorwaldsen's Museum is, in Copenhagen, a part of the laboring man's holiday. Many mechanical apprentices go there and study. Since the opening of this museum, the Danish house-furniture has taken the best prizes in all the great world-expositions, and it is believed that the taste thus displayed has been one of the direct results of the educational influences of the museum. The study of sculpture has power to educate the taste of the carriage-maker in a similar manner.

COPAL OF ZANZIBAR.

Among the specimens of vegetation growing along the coast of the bay of Dan-Salam, in the southern end of the island of Zanzibar, is the *Trachylobium mossambicense,* which the native inhabitants call *M'ti-Sandaruski,* or the tree of copal. A resinous, translucent, hard and brittle exudation is found on its trunk and principal branches. The upper branches, too, exude a resin which, however, is never found in a liquid state, from whence it may be justly inferred that it concretes and hardens very soon after its exudation. On account of its brittleness it cracks from the branches by the least movement. Insects are often found inclosed in such pieces, all of which present a uniform surface, as if they were polished, but none of them show that rough surface, called goose-flesh, which is characteristic of all fossil gums found in the earth. This sort is carried in large quantities to India, but as yet does not reach Europe.

After satisfying himself that the *Trachylobium* was the source of a sort of copal, Mr. M. T. Kirk, who has made considerable investigation into this subject, has admitted that the old copal of Zanzibar, well known in Europe as a half-fossil resin, and commonly used in the manufacture of varnishes, was likely to be a product of the same tree.

There are three different sorts of copal of Zanzibar, which the merchants distinguish by color, surface, general appearance, and other indications, and which they further subdivide. The first sort is called *Sandaruski-M'ti,* or copal of tree, and the second *Chakazzi,* or copal found in the earth, which, however, is similar to the first and of the same value. The third sort, which is the true copal *Sandaruski,* is, as the second, found in the earth, but it is harder, less soluble, and commands more than double the price. This last sort comprises the largest quantity of Zanzibar copal, and often 400,000 kilogrammes, worth 1,500,000 frs., are exported during the year to Europe.

The *Trachylobium mossambicense,* which, as shown, affords the first sort of copal of Zanzibar, the tree copal, grows along the coast of Mozambique as far as Lamo, from the 10th to the 15th degree of southern latitude. It is very frequent between Delgado and Monbos, abounding near the bays and the banks of the rivers, but it grows rare at a short distance from the sea, and still further inland it disappears. The second sort, *Chakazzi,* is found clinging to the roots of the copal-tree, and it is, as Mr. Kirk has ascertained, really the same sort as the first, but mixed with the third. It is found only in the neighborhood of forests still living, where the third sort never is found, and it is evidently a fresh resin which has fallen to the ground a little after the decay of the mother-tree, though still fresh enough to receive and preserve impressions from sand, stones, or other hard bodies; but crafty people understand how to mix these inferior resins from the coast with those more valuable from the inner land.

The true copal is undoubtedly a product of forests which have been destroyed; no living tree gives such a product. It is only found in the woodless inner land, where the native inhabitants dig the soil, when softened by heavy rain-storms, searching after the resin, to sell it to the foreign merchants. This fossil resin, when compared with the fresh one, resembles it in its physical character, but it affords no true evidence of being produced from the *Trachylobium.* The insects inclosed in it are all winged insects, and the leaves which sometimes are found inclosed in it together with the insects do not seem to belong to the copal-tree. Yet, when it is remembered that the resin hardens very soon after exudating, and that it cracks from the branches just at the time when leaves and flowers are in full vigor on their tops, it is evident that leaves of the shrubbery growing below the copal-tree are more likely to be found in the exudations than those of the tree itself.

Such is the origin of the copal, which forms one of the principal ingredients of coach varnish, and such are the three principal classes into which Zanzibar copal is divided.

A RARE OPPORTUNITY.

Coach-Builders' Library.—We have prepared the list of books relating to coach-building and its branches, as heralded last month, but it is crowded out from the present issue. We shall present it in the next number, and meanwhile would be glad to receive further assistance from our friends in extending the list.