THE VIAGRAPH: AN INSTRUMENT FOR MEASURING ROAD WEAR.

BY CHARLES LAVELL.

A most ingenious invention is the viagraph, an instrument for measuring and registering wear in road surfaces. During a recent dispute between the London County Council and a firm of paving contractors, it furnished data of the most valuable and unimpeachable character, putting into evidence facts which there was no disputing. In appearance the viagraph somewhat resembles a child's sled. Its body consists mainly of two parallel runners, 12 feet long, made of mahogany, with brass fittings. Between these, and protected from the elements by a glazed cover, is placed the recording mechanism, a combination of highly ingenious yet easily comprehended devices.

When the viagraph is prepared for a test, the principal recording factors—a steel-shod skate, shaped like a section of an ordinary cart wheel, 40 inches in diameter, and a cog-wheel—are both brought into contact with the surface to be surveyed. The skate and wheel are each connected, by means of delicately adjusted levers, with a paper-bearing cylinder, upon which, as the instrument travels, two lines are reproduced by means of pens; one records the profile of the road traversed in a more or less agitated line, on a scale of ⅛ inch to the foot; the other indicates a datum line. As the skate drops into a rut, so the lever connected therewith records the inequality upon the paper chart.

Not only does the instrument record in a profile map the inequalities over which it passes, but it places the fact in an even more comprehensive form by indicating, on a system of decimal dials, the sum total of such unevennesses in feet per mile. By means of a ratchet wheel and delicate triple pawl, the registration of upward movements, i.e., where the instrument passes over pebbles or other loose rubbish lying above the surface, is avoided.

It will be obvious that in order to compare the condition of one tested surface with another, a standard length of road must be employed as a unit. For this purpose, 88 yards, as being the 1-20 of a mile, is measured automatically upon the paper cylinder, and a bell warns the operator when this distance (represented by 33 inches of paper on the drum) has been covered, when his assistant immediately ceases towing.

By taking impressions of recognized excellent roads, comparisons can easily be made between the tested surface and others.

It is usual in making these tests to take several diagrams from the crown and sides of the road under survey, striking an average to arrive at the amount of depreciation.

The following table has been drawn up, which will enable the surveyor to see at a glance under which head the road he has surveyed with the viagraph may be classified.

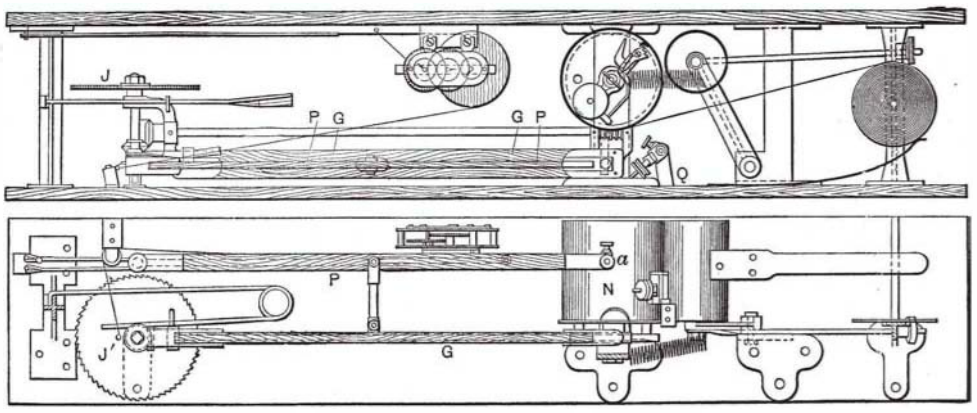
The instrument is drawn over the road under test by means of a cord, which should be handled intelligently, as uneven towage, jerking, or twisting the apparatus is apt to affect the accuracy of its results.

Such an instrument cannot be too highly recommended to the notice of road surveyors and others who are responsible for the making and upkeep of highways. In disputes between municipal authorities and contractors, the value of such an infallible means of checking wear and tear upon roads will be obvious.

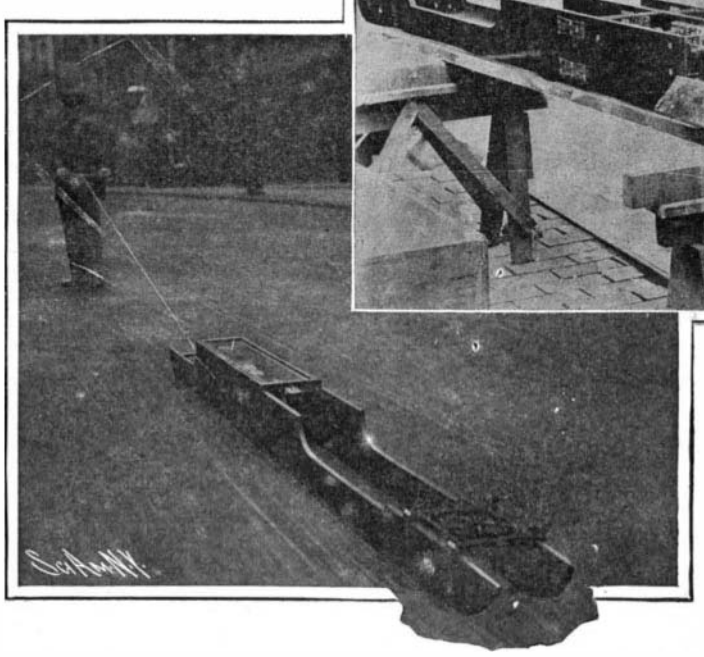
Eye inspection in such cases is most misleading, and its value practically *nil*, because no two witnesses could estimate the depreciation alike. And in binding contractors to a definite quality in maintaining and laying down roads, the viagraph affords undeniable proof of its merits, as it will indisputably convict the contractor in the case of excess of wear or neglect—or worse.

The writer is indebted to Messrs. Glenfield and Kennedy, of Kilmarnock, Scotland, N. B., for diagrams reproduced here.

Numerical index of unevenness in feet per mile.	Condition of road surface.
15	Excellent.
30	Good.
45	Fair.
60	Passable.
80 to 100	Bad.

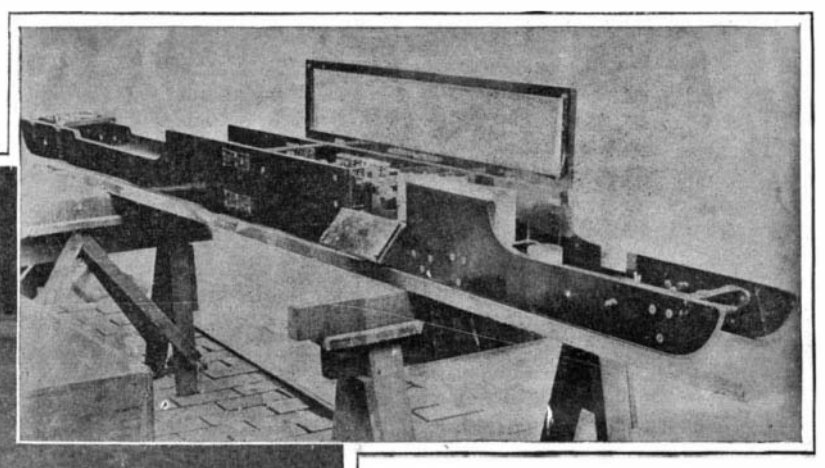


The Operative Mechanism of the Viagraph.



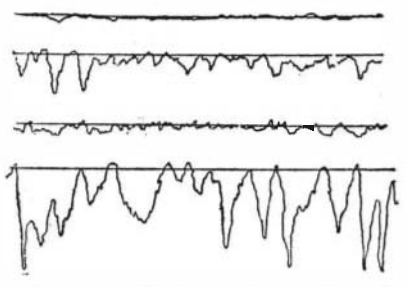
On the Road.

Getting Ready for a Test.



Showing Hinges Which Permit Runners to Fold Back for Easy Transportation.

Testing a Pavement.



Viagraph Tracings from Different Roads.

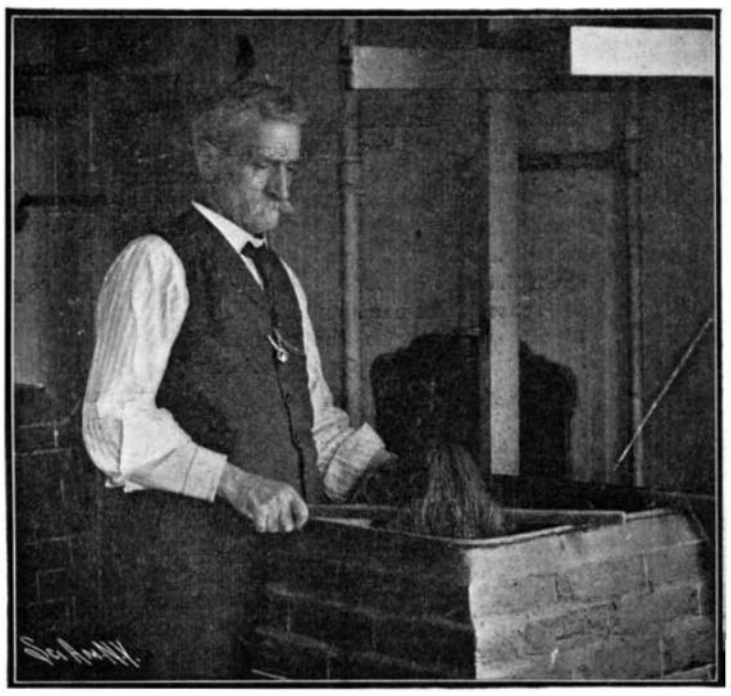
THE VIAGRAPH: A ROAD-TESTING MACHINE.

A new process, of taxidermal value, has been devised by an English naturalist, Mr. Charles D. Head, for stuffing animals and birds, the feature of which is that the objects are rendered life-like. The skins are made permanently soft and pliable, and can be moved freely into natural positions. The process is principally a specialty in skin-dressing, and free movement is left in every joint of the body. Another point is that the skins and feathers wear well, and can withstand considerable rough usage.

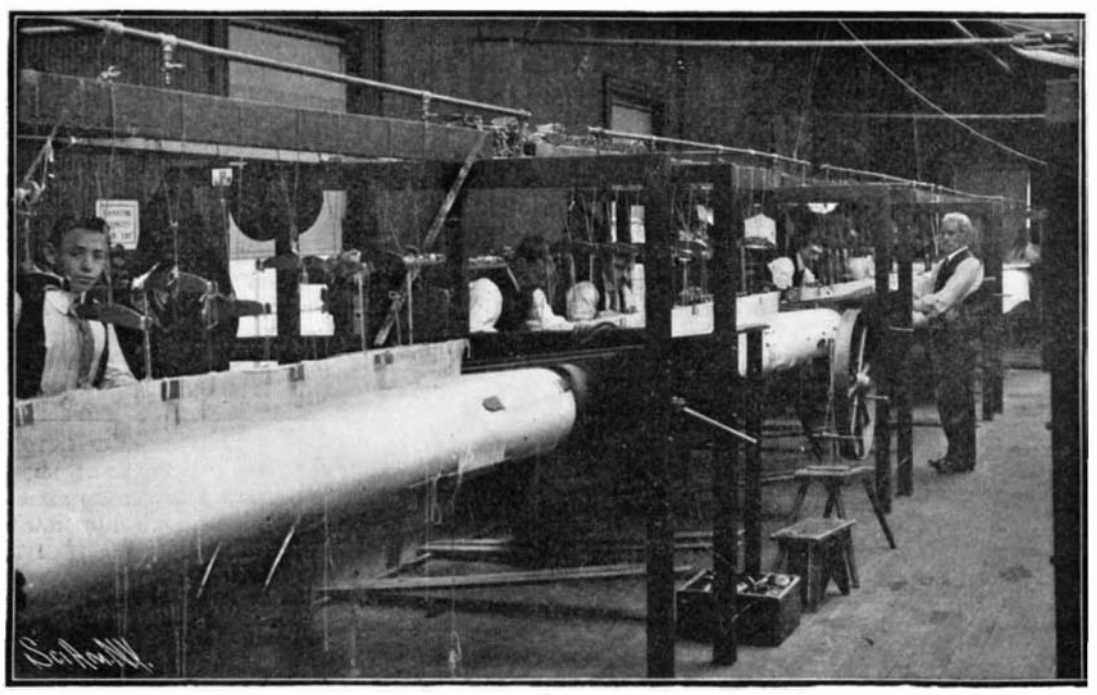
THE MAKING OF A GOBELIN TAPESTRY.

The art of transmitting ornamental figures or designs on the loom is probably nearly as old as that of painting them on a wall or a panel. The Egyptians, the founders of so many industries, knew at an early age the art of ornamenting fabrics by weaving, embroidery, and the application of colors. In the subterraneous temples at Beni-Hassan, the wall paintings, which date back to 3000 B. C., show the representation of an upright loom, which in general arrangement and even in detail is singularly similar to that used to-day. Nor are historical proofs wanting that the Egyptians of the time of the Pharaohs produced fabrics of extraordinary richness and fineness, which might be compared favorably with examples of the modern industry. The same may be said of western Asia and Greece. The ancient authors are unanimous in proclaiming the magnificence displayed by Babylon and Nineveh in textile hangings and carpets, and there are many records of the enormous prices paid by nobles and patricians of Rome for Babylonian tapestries. The oldest pieces of tapestry extant to-day do not date back further than the end of the twelfth century, and there are but a few of these. Undoubted evidence exists that all these specimens were produced in Germany about the year 1200. During the thirteenth century, tapestry making is supposed to have found its re-birth, and according to the old historians many important examples must have been produced, though only one exists to-day. The fourteenth century saw the rise of the art to great strength and importance, especially in France and Flanders. Paris, Arras, and Brussels secured for themselves the supremacy, owing to the skill of their weavers. The fifteenth century was the golden age of tapestry making, and the ateliers of northern France and Flanders rose to a height and attained a perfection in this art hitherto unknown, Arras eclipsing all its rivals. In this century the industry was started in Italy by emigrant weavers from France and Flanders, and soon the Italian painters furnished designs for tapestry, not only for their own weavers, but also for those of all other countries. The sixteenth century and the Renaissance consecrated the part the middle ages had assigned to tapestry, and saw the rise of the Italian weavers to an equal with those of other nationalities. In the seventeenth century occurred the establishment of the world-famous Gobelin factory in Paris, and from that time France steps into the front rank in the art of tapestry making, which it has held ever since. During the eighteenth century tapestry held its own or even increased in popularity though changing in style, but with the end of that century we come to the end of the last important era of the industry, followed by its gradual decay. Up to within a few years the Gobelin factory alone, of the innumerable ones formerly engaged in the industry, has continued in operation since the period above mentioned.

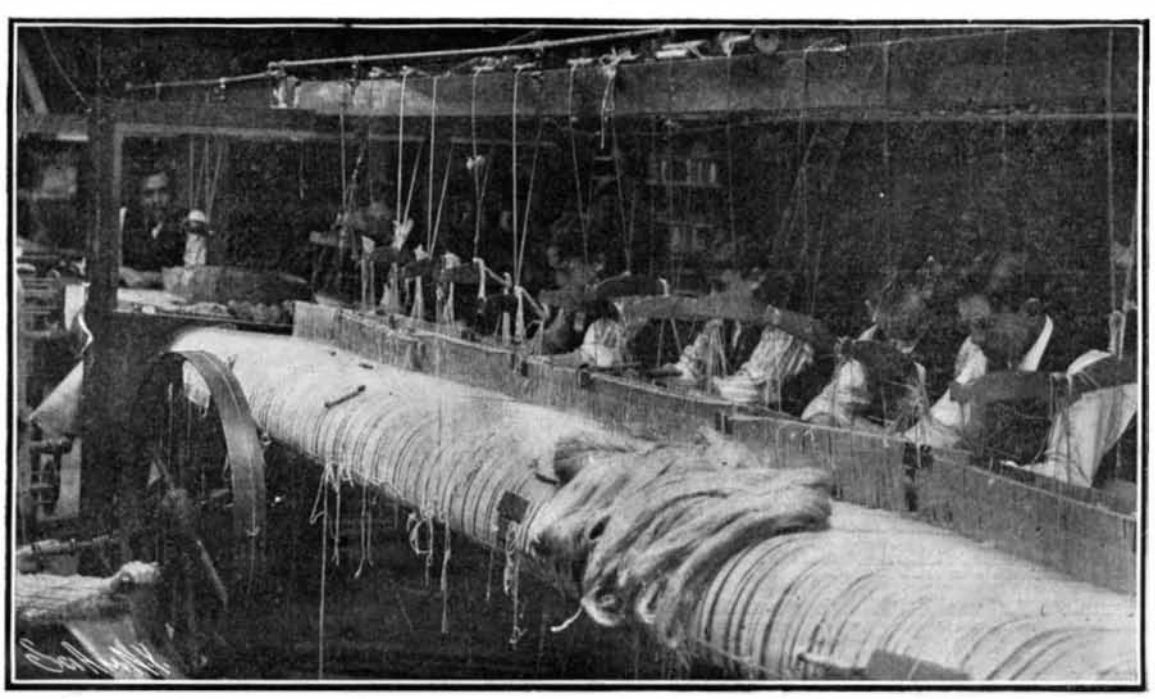
In recent years tapestry making has had a sort of revival, and thanks to the efforts of a few men of taste, is beginning to take its rightful place in the world of art once more. Besides the two factories of the French government, the Gobelins and the Beauvais, there are a number of private establishments of some importance in France, in Italy, and in Germany. A factory was started in England in 1876, but was



Dyeing the Yarn.



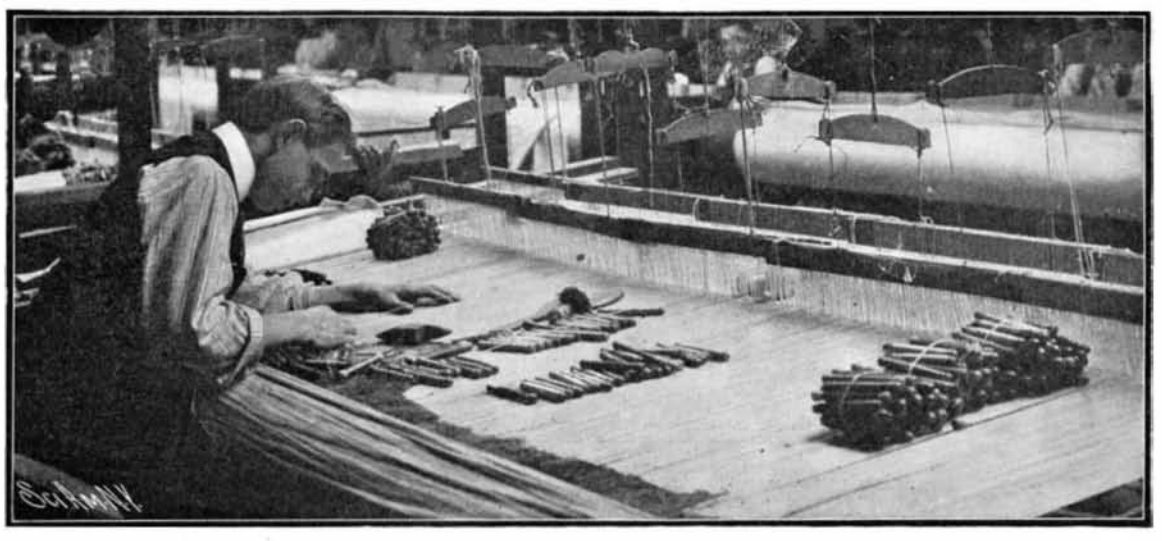
Low-warp Horizontal or Basse Lisse Loom.



Loom with Heddles for Lifting Alternate Warp-threads to Allow Passage of the Bobbin.

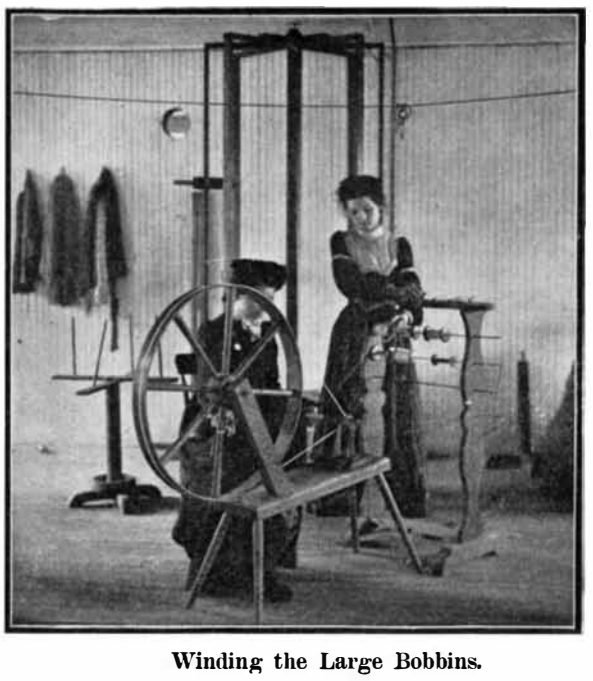
Passing the Bobbin Under the Warp-thread.

Ironing the Finished Tapestry.



Passing the Bobbin under the Warp-thread.

Sewing and Finishing the Tapestry as It Comes from the Loom.



Winding the Large Bobbins.

THE MAKING OF A GOBELIN TAPESTRY.

not economically managed, and failed. The making of tapestry in this country is only of comparatively recent date and, we believe, was first introduced in 1893, when Mr. William Baumgarten, of New York, set up the first loom in this city, and imported the first French weaver. Since then, this modest beginning has grown into a factory of considerable size, located at Williamsbridge, New York. While most of the workmen are French weavers imported from Europe for the purpose, Mr. Baumgarten has wisely begun to apprentice American boys to the trade, with the intention of eventually making the industry truly a native one.

Tapestry making is intermediate between embroidery and true weaving. Tapestry is a fabric worked on a chain of threads, which are drawn vertically, *haute lisse*, or horizontally, *basse lisse*, and around which are woven the colored threads of silk or wool, thus making one body and producing a stuff in which the lines and tints form combinations analogous to those which the painter obtains with his brush or the mosaic worker with pieces of colored marble. The laying in of the colored threads is done entirely by hand, and the weaver follows line by line the painting he is to copy. In the high-warp or *haute lisse* loom, two uprights of wood or iron support two movable cylinders, *ensouples*, one at each end, on which the warp threads are stretched at will. These threads are usually the length of the tapestry, which is rolled up on the lower cylinders as the work progresses. The weaver works at the back of the loom, where the design is sketched on the warp threads. He places the cartoon behind him, using it to get the design and match the colors. Occasionally he steps around to the front to get the effect on the right side. The threads are woven in and out like basket work, a little patch of color at a time, the different colors being wound on separate spindles or bobbins, and the proper warp threads being lifted by hand to permit the passage of the bobbin. Each portion of the weave must be traversed twice, as only alternate threads are covered on the right side. Thus tapestry is a double cloth. When the thread has been woven only one way, it is called a half-pass; when it is turned back the other way, completing the covering of the warp, it is called a woof. When the weaver has finished using a given color, he does not break the thread, but leaves the spindle hanging at the back till he requires the color again. When two or three threads have been added to the weave, they are forced or compacted together and against the already completed portion by means of a flat, short-toothed, metal comb in the hand of the worker. It will readily be seen that in the vertical lines of a design, in weaving the colors, open slits will be left, which must be afterward sewed together. For this reason many of the Oriental tapestries have no lines running in the direction of the warp, but only zigzags.

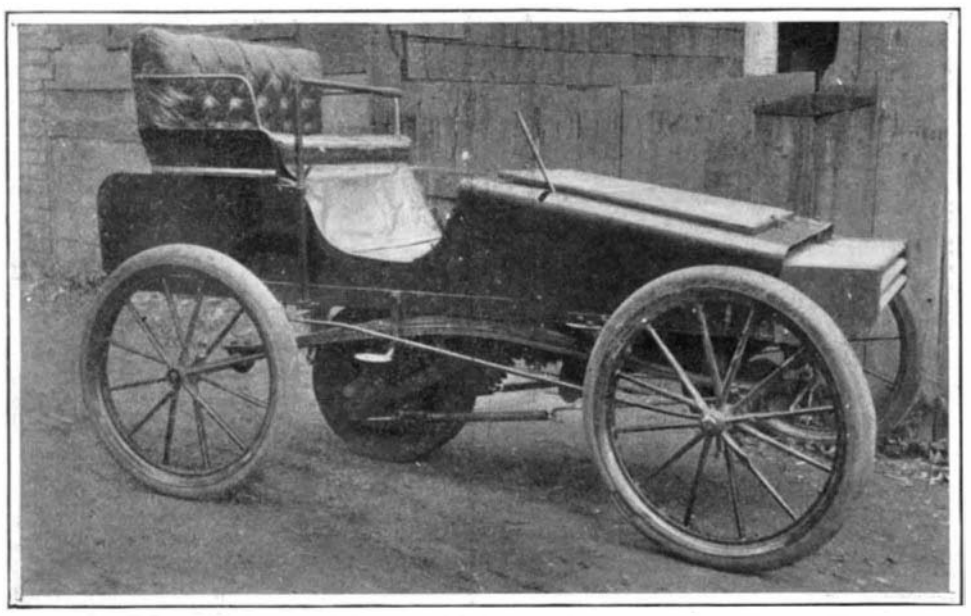
The low-warp or *basse lisse* loom is similar to the above, with the difference that the two cylinders are fastened to supports parallel to the ground, so that the warp threads instead of being vertical are horizontal. The cartoon is placed beneath the warp threads, so that the weaver may watch his work and the model at the same time, the design not being sketched on the warp threads. In this loom the warp threads are moved by heddles connected to treadles, leaving both hands free for the weaving. The work may consequently be done more rapidly, but is not as satisfactory, as the weaver can see it but imperfectly till it is completed. The colored threads are first wound on large bobbins, and then as the weaver requires them are wound on the small bobbins used in the work.

The warp threads are white cotton or wool, while the colored threads are wool or silk with silver or gold threads as required by the design. The dyeing of the multitude of tints used in the work is in itself an art requiring no little skill. The most imperishable vegetable dyes only are used, and the raw cotton, wool, or silk is all of American manufacture.

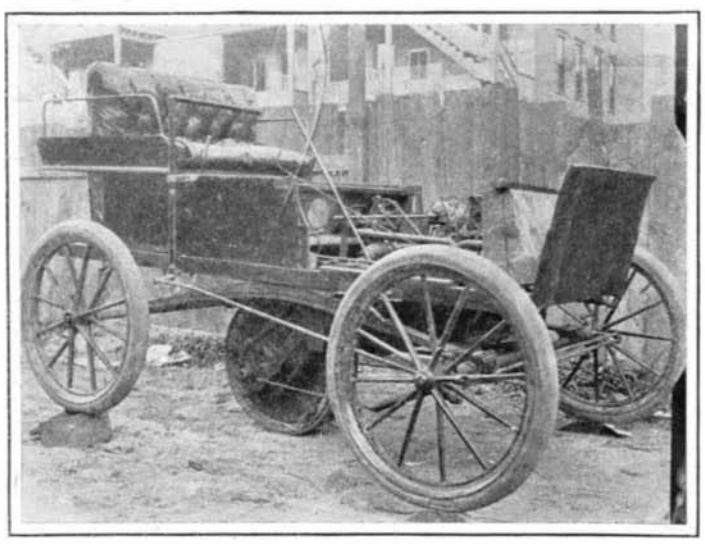
The very finest work is done on the *haute lisse* looms, though it is claimed that there is really little difference in the quality of the tapestry from these and the *basse lisse* looms. The looms shown in the photographs are all of the latter kind. It appears almost marvelous that representations so true to life, so accurate, and of such beauty in drawing, coloring, and execution, can be made with so primitive an apparatus, and to the skill alone of the weaver and of the designer is credit really due.

A NOVEL FIVE-WHEELED AUTOMOBILE.

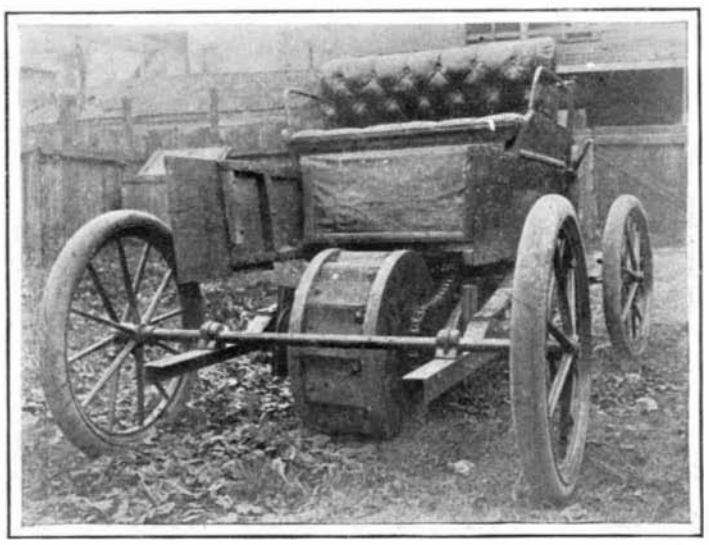
The automobile shown in the accompanying illustrations has been designed upon the same principle as a snow locomotive which we illustrated in our 1903 Automobile Number. It is propelled by a drum-like fifth wheel, arranged under the center of the vehicle to run in bearings on two hinged arms, which project downward at a slight inclination, and are drawn forward by tension springs. The idea of these springs is that they tend to hold the wheel against the ground, and increase its tractive power. This tension is under the control of the operator when the machine is traversing a bad road. On any other than a very bad road, it is entirely automatic. When the engine turns the drive wheel, and the vehicle is hard to start owing to a bad road, or an obstruction in front of the wheels, the drive wheel will take practically the entire weight of the vehicle on itself, thus increasing its traction and relieving the other wheels of any considerable weight. The drive wheel is made hollow and used as a muffler, or, when a steam engine is used for power, it can be both the muffler and water tank as well. Besides doing away with the differential gear, this simple fifth-wheel arrangement makes possible a solid rear axle, and also renders unnecessary the use of rubber tires on commercial vehicles. The construction of the wheel may be seen from the illustration showing the rear of the automobile. It has two side disks, between which are bolted face plates of soft cast steel, which are practically indestructible, and which, on granite or stone pavement, will not slip, as this metal will hold on stones when the weight is all upon a single driving wheel. These plates are readily removable, and can be replaced in winter by toothed plates for use on ice or snow. When the machine is running on soft sand or mud, it is driven through the flat plates, but on any ordinary road, the side disks do the driving. The vehicle shown has a 4 x 4 four-cylinder, horizontal, gasoline moter, placed at the front. The transmission is from the engine to a countershaft, and from the countershaft to the driving wheel by means of a chain. A gear transmission can be used, and is found preferable with heavier machines. In the side view of the complete automobile, the drum is shown driven by gears, while in the rear view a chain drive is employed. The drum of this vehicle is 26 inches in diameter and has a 5-inch face. A drum of this width, with the side disks shod with rubber tires, has been found sufficient for an ordinary two to five passenger automobile. The picture showing the machine mounting four 6-inch blocks demonstrates its tractive ability. As most of the weight comes upon the center driving wheel, the latter easily raises the car over obstructions. With longer arms for carrying the driving wheel, the inventor has been able to easily surmount 10-inch blocks in the manner shown. These driving arms are hinged about the countershaft, which also carries a planetary gear transmission. The tractive ability of this little machine is shown by the fact that it hauled two heavy coal wagons, weighing two tons each without a load, but with the wheels of one of them locked so as to slide. It was necessary to place two men on the rear of the machine to keep it from being lifted off the ground, and every time the machine was started, the front end would be lifted momentarily, and afterward rest but lightly on the ground.



Side View of the Complete Automobile, Showing Transmission of Power to Drum by Gears.



The Machine with Bonnet Removed, Showing Small Amount of Machinery Beneath.



Rear of Car, Showing Construction of Drum, Which is Here Shown Driven by a Chain.

AUTOMOBILE PROPELLED BY A FIFTH WHEEL, OR DRIVING DRUM.

The inventor of this machine, Mr. George T. Glover, of Chicago, Ill., states that this principle can be applied to heavy commercial automobiles, which can be made not only to propel themselves successfully, but also to haul heavy loaded trucks. He has under construction trucks of 100 and 200 horse-power, the latter being fitted with a twelve-cylinder engine, and being designed for the purpose of hauling a train of stone-laden wagons.

The fact that the fifth-wheel automobile carries practically all the weight on its driving wheel, which has a tendency to raise the machine and get under the load when power is applied, makes it possible to use this machine under conditions where the ordinary method of propulsion by the rear wheels has been found wanting on account of insufficient traction. Such a machine can, therefore, be used on plowed fields or muddy roads, and should be found invaluable to the farmer for haulage work about the farm, as well as for drawing his produce to market. The fact that this system of propulsion has been in successful use for several years on a huge snow locomotive, thus demonstrating its entire practicability, should make it apparent to all that it is a step in the right direction toward the perfecting of commercial vehicles.

A gasoline motor omnibus traffic service has been inaugurated in the Isle of Wight, which will perform the various functions of transporting passengers, freight, newspapers, and collecting mails. All the principal towns and villages of the island are to be linked together, so that a cheap, frequent, and rapid service is offered to even the most rural outlying parts. The omnibuses are provided with accommodation for transporting five hundredweight of freight on the roof, without in any way impeding the view of outside passengers. Also, each omnibus is fitted with a pillar-box for the collection of letters. By an arrangement with the Postal Department, passengers and the general public will be able to post letters at any of the usual stopping-places. Every village in the island will therefore have as many dispatches as the principal town of Ryde, from which the service runs.