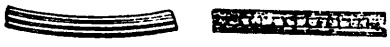
the bottom of the groove at the centre of the car. All partitions, inside finish, and head lining, before they are nailed up inside the cars, should have a covering of some heavy material, similar to old window curtain material, tacked or glued on between the frame and inside finish, to prevent the car from creaking.

On account of the frequent change of temperature in railway cars from warm to cold and damp weather, much more skill and care is required in building the cabinet work for the interior finish, than would naturally be required for the building of furniture. The system usually adopted for veneering of furniture would not stand in a coach or sleeper. In passenger cars it has been found necessary to cross-band all veneered work. Following is a cut of built-up work for partitions and berth fronts.



A great deal of care is also required when building the inside finish, to keep the materials in a moderately warm shop, so that they will not absorb dampness, and also to give the materials the second drying in heater boxes before the work is glued together, in order to drive out any dampness that the wood may have absorbed in laying around the shop.

The question of glue is also a very important one, as poor glue would not have the proper strength and would deteriorate; thousands of dollars would be wasted, and all the good work of the cabinetmakers would be lost. The glue which will absorb the most water and make the thickest gelatine is considered the best; but the question of slow or quick drying has also to be considered. For making glue joints, quicker drying glue is preferable, but for veneering purposes a slow drying glue is required; for instance, a glue which would be first-class in every other respect but quick drying would not give the same satisfaction for veneering as a slower drying glue, as it would set too hard before the cabinetmakers would be able to get their work into the presses, and the hot cauls placed and screwed down; and should there be any occasion to glue up material that is much exposed to dampness, a small amount of bi-chromate of potash can be mixed in to make it impervious to moisture; this is especially good for pattern makers. The time for veneered work to thoroughly dry requires about three weeks in a moderately warm room; this is especially the case where inlaid work is used for veneering. Veneer work that is cleaned up sooner than that is liable to show pit holes, and an uneven surface after it is varnished, but it is not always that the cabinetmaker can get so long a time to allow his work to lay and dry.

In veneering wooden cauls, galvanized iron smoothened, or sheet copper is used for heating in the heater boxes and laying between the veneers in the presses; some use zinc, possibly on account of its smoothness, but this is an error, as zinc is not a good retainer of heat. Copper and galvanized iron make a good caul for veneered circular work, such as berth fronts, etc. If one sheet of galvanized iron is not found to be sufficient, two may be used.

The preparing of fancy grain veneers for car work is a problem that very few of the present time cabinetmakers understand, until they come to work in a first-class car shop. The richest veneers in color are usually very cross-grained, and in preparing this kind of veneer it is necessary to thoroughly glue-size it and press it between hot cauls before it is laid. This is to thoroughly shrink it so that it will not crack after laying. But there are some very rich-colored, mahogany veneers, which are so cross-grained where the grain is so short, that it is almost impossible to prevent them from cracking after they have been veneered; but in varnishing this kind of veneer, varnishing on the veneers without shellacing is found to be an advantage, as that the varnish will penetrate the wood deeper and fill the pores up better than shellac. In receiving the veneers from the saw, a good many veneers may be discolored with black, glossy spots; these all have to be tooth-planed off, as glue will not stick where these veneers are spotted.

The wood machine department, for getting out the interior finish for the cabinetmakers, is usually placed under the foreman of the cabinet shop, who makes out his bills for the interior work. In this department a good class of mechanics are required, who should also have the knowledge of how the work is going up in the car; by having this knowledge, they can work up materials to better advantage without waste, and by doing careful machine work a great deal of labor can be saved by the cabinetmakers.

A better class of upholstering work is required for passenger cars than for furniture. The same class of work that is done on furniture would not stand very long in cars; more springs are required and set up better. For covering of car seats, numerous materials and plushes are used; but, in my opinion, the best wearing material is crimson plush, but on account of its color it is not always advisable to use it. Seats and backs covered with rattan are preferable, especially for suburban coaches and summer travel, and leather for smoking-rooms and smoking-cars. Cheaper materials are also largely used for second class cars, which give very good service.

In the car heating department first-class workmanship is required, with good materials, as the strain on the heater pipes in a car is much harder than in an ordinary house; the best grade of pipe, extra heavy, is used, with wrought iron or steel couplings. I will not attempt to go into any of the details of steam heating, but the ordinary procedure for fitting up a new car is to put the heater pipes in first before any of the partitions are put up; this gives the steam-fitters a free chance to work in the car.

The tinsmith department is also a very important branch in car building, and where cars are fitted up with overhead water tanks; in localities where the water is alkali, copper tanks only should be used as they will last much longer. Galvanized iron tanks may give good satisfaction on roads where the water is soft, but where the water is alkali they are liable to give out in one year.

The modes of lighting a car are by oil, Pintsch gas, acetylene gas and electricity. In reference to the latter, it is still in its experimental stages. The gas receivers and manner of piping are somewhat similar for both the Pintsch and acetylene gas; the latter gives a much brighter light.

Air brakes on the modern car are more powerful than formerly, some using 16 in. cylinders with high speed brake, and, in place of being fastened to the bottom of the car on a wooden plank, the cylinder is now bolted to an iron frame, which, in turn, is bolted to the sills.

All cars of more recent build have steel platforms. The side motion for the coupler has been increased of late years from 3 to 6 in., and in some cases a little more. This was found desirable to allow for easier curving and less wear on wheel flanges. Roller side bearings have also been introduced on late cars for the same purpose.

In building the trucks, considerable iron work now enters into the construction. The wheel pieces, cross timbers, and end sills are all lined with iron plates, and malleable iron corner plates applied. Of late years, journals have been largely increased in size. There have been a number of different styles of journals, journal wedges and brasses used, but, in my opinion, the best system of journals, journal wedges and brasses, is the M.C.B. standard. In addition to this, roller bearings are now being experimented with, and should they prove successful, both as to service and cost, no doubt will be another marked advance in car building. In connection with trucks, we hear a great deal said and written about hot journals, but, in this respect, I wish to state that this can easily be overcome, at least, when cars leave the shops, by carefully finishing the journals so that there are no rough places. It is surprising the small amount of roughness on a journal that will cause a box to run hot; in some cases it is almost imperceptible. In addition to the care of the journals, the boxes should be properly packed and oiled; with the box working easily in the pedestal, and proper end motion for the brass, and with a truck fitted up in this way there is no danger of heating with the heaviest cars.

The process for painting and varnishing the outside of a new passenger car.—Natural wood finish, one coat, no. 1 primer, and allowed to stand two days, and then fill; then sandpaper, varnish one coat, putty and ornament, and finished with three coats of varnish. On natural wood finish cars, it is necessary to give one more coat of varnish than for painted cars. Painted cars have from three to four coats of paint, with usually two coats of color applied before varnishing.

The foregoing is a description of a part of the work in building a present day passenger car, but after this car is completely finished and ready for service, I consider it an absurdity on account of its weight. A tendency of late years has been to build the cars longer and strengthen them in all weak parts to ensure the safety of the public, and this has increased the weight until the management of the roads are bending their energies towards building heavier engines to haul heavier trains; this, in my opinion, is an absurdity, because expenses will increase in keeping up the road bed. If the same amount of energy was expended in building a car out of lighter and stronger material, such as aluminum, a market would be created for this material, and cheaper ways of manufacturing it would probably soon be adopted. This, in my opinion, is the ideal material for building railway cars in the future, to take the place of wood, iron, and brass trimmings, and I feel satisfied that it would not be very long before a car built of this material could be built as cheaply as the present car, and the weight would then be reduced to a minimum. To commence with, the outside to be covered with sheets of aluminum $\frac{1}{8}$ inch thick; this would make a handsome car and be a big saving in maintenance in keeping up repairs and would be easier to keep clean while in service.

The foregoing paper was read at a recent meeting of the Canadian Railway Club.

The Canadian White Co., Montreal, has received the contract for the whole work of constructing the Federal Life Assurance Co.'s head office at Hamilton, Ont. It will be an eight story modern steel construction, fireproof structure and is to be completed by Aug. 1, 1906.

In our Oct. issue we gave some facts about the Canadian Freight Association and its various presidents. The position of secretary has been occupied as follows: 1883-4, E. Tiffin, Credit Valley Ry.; 1885-6, R. Quinn, G.T.R.; 1887-1890, A. H. Harris, G.T.R.; 1891-5, W. B. Bulling, C.P.R.; 1896-1905, J. Earls; 1905, T. Marshall.