

# The Motor Truck in Manufacturing\*

Its Utility, Adaptability, Capacity and Economy Under Suitable Conditions

By Harold Whiting Slauson

THERE is probably no place where the motor truck is surrounded by more favorable conditions for efficient operation than in the average manufacturing business. Machines are used throughout for the production of the goods; why should not mechanical power be employed for the transportation of the raw and finished material? No matter how large or how small the plant may be, and regardless of the size, nature, or quantity of the product, a motor truck transportation, delivery, and hauling service *must* show a marked saving in time and money over the horse type, if the former is properly installed and operated under efficient conditions. As power-driven machines have reduced the cost of manufacturing goods, so will motor-propelled trucks lessen the hauling charges for those goods.

These may seem like sweeping statements, but they are attested to by thousands of successful truck installations in hundreds of different kinds of manufacturing businesses. The success of these proves the adaptability of the motor vehicle, for each of these manufacturing lines may require its trucks to operate under conditions absolutely different from any of the others. By means of special bodies and a wide selection of types and sizes of power plant, a variety of combinations can be obtained, the proper selection of which will allow almost any operating conditions to be fulfilled.

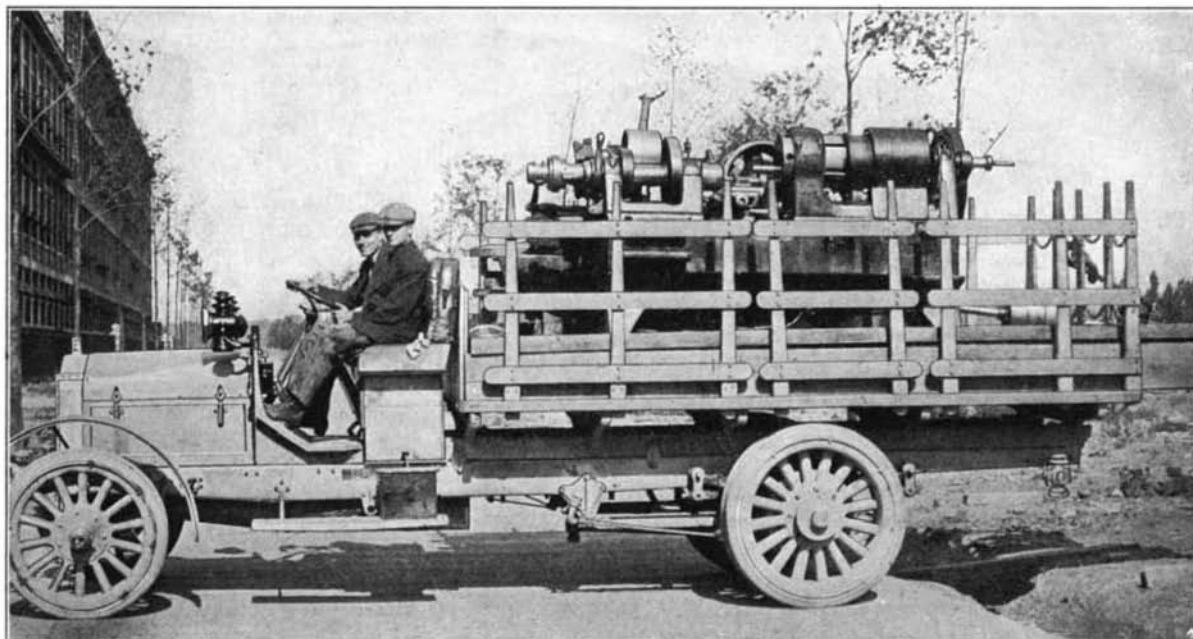


Fig. 1.—Auto Truck Carrying Machinery to the Freight Depot.

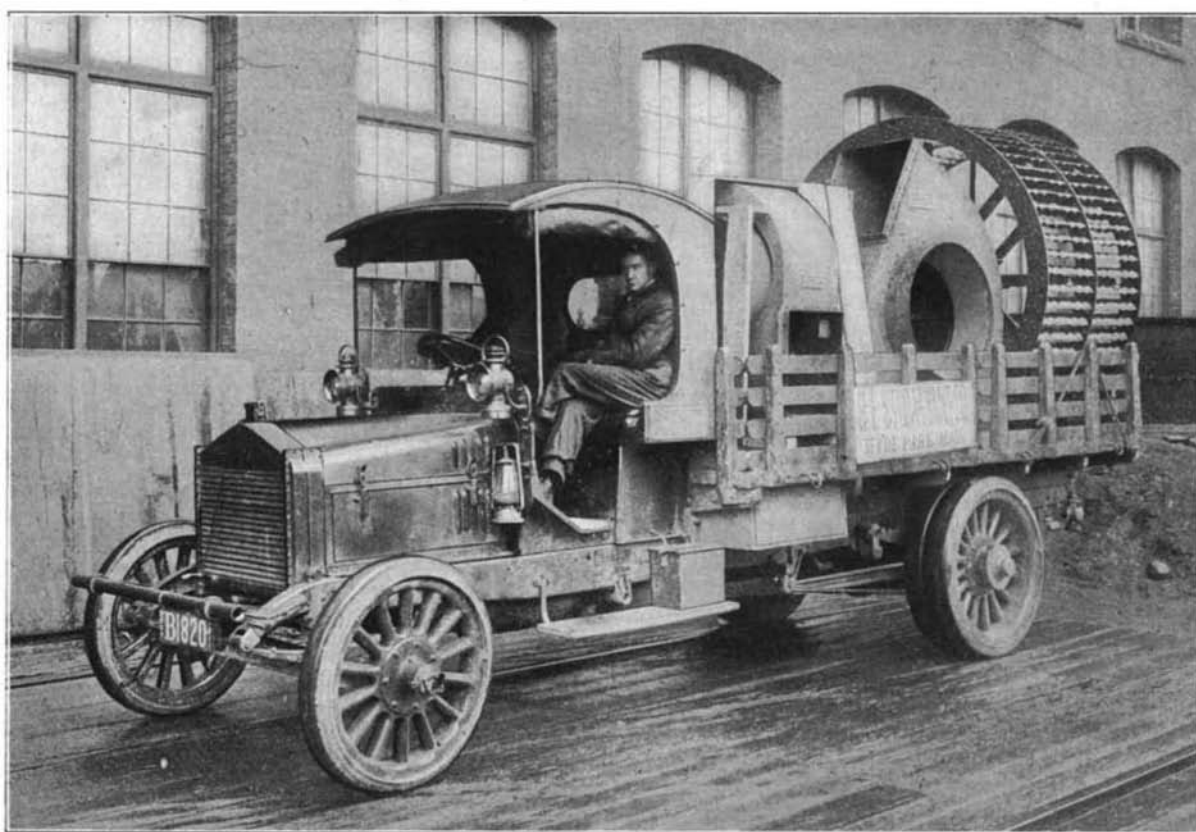


Fig. 2.—Five-ton Worm-driven Truck Used by a Large Manufacturing Company for Carrying Heavy Castings and Large Parts of Machinery.

filled. A few years ago the motor truck cost more to install and to operate than the horses and wagons required to perform the same amount of work, and this excess expenditure was charged to advertising; but the modern motor truck has been brought to the point

where it can show an actual dollar-and-cents saving, and even on this one merit alone can the mechanical means of transportation compete with the horse. Figuring interest on the investment at 6 per cent, depreciation at 10 per cent, chauffeurs' wages higher than those paid to horse drivers, and insurance premiums and re-

pairs at a larger amount than would ordinarily be required in practice, the properly-organized truck installation will show a saving of from 10 to 30 per cent over the maintenance expenditure of a horse system.

From an investigation of many installations made by one company, it was found that interest, insurance, garage expenses, and driver's wages constituted a daily fixed charge of \$5.32 for a 5-ton truck. This charge, of course, continues whether the truck is in use or not, and remains constant regardless of the mileage covered. Operating expenses, such as those for tires, gasoline, lubricating oil, and allowance for repairs, overhauling, and depreciation amounted to 15½ cents a mile. For a 50-mile day, the total expense would amount to the fixed charge of \$5.32, plus 50 times the 15½ cents per mile operating cost, or \$13.07 per day.

This strikes the keynote of the secret of a successful truck installation. Inasmuch as the \$5.32 represents a fixed charge that is not affected by the distance that the truck travels, it is evident that the cost per ton-mile will be reduced as the daily mileage is increased. A 5-ton truck traveling 50 miles a day has a ton-mile capacity of 250. Inasmuch as there is but little difference between the operating cost of a loaded truck and one running empty, it will be seen that the hauling expense per ton mile may be reduced to slightly over \$0.05. This is on the assumption, however, that the truck will be run at full load at all times—a condition which, obviously, cannot be attained in the average installation. If the truck is run loaded in one direction and returns empty, the hauling cost per ton-mile will be doubled.

There are, consequently, four broad, general conditions to be met in order to secure the most efficient installation. The truck must be selected with due regard to its capacity; its work must be so laid out and routes so arranged that but a minimum amount of time will be spent in idleness, and its active hours must be employed in hauling loads approaching as nearly as possible to its rated capacity; its construction must be such that the necessity for repairs will

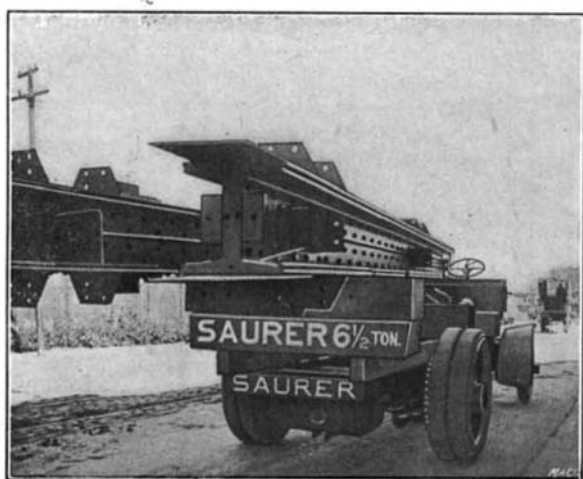


Fig. 3.—A Six and One Half Ton Truck Hauling Steel Girders for an Office Building Construction.

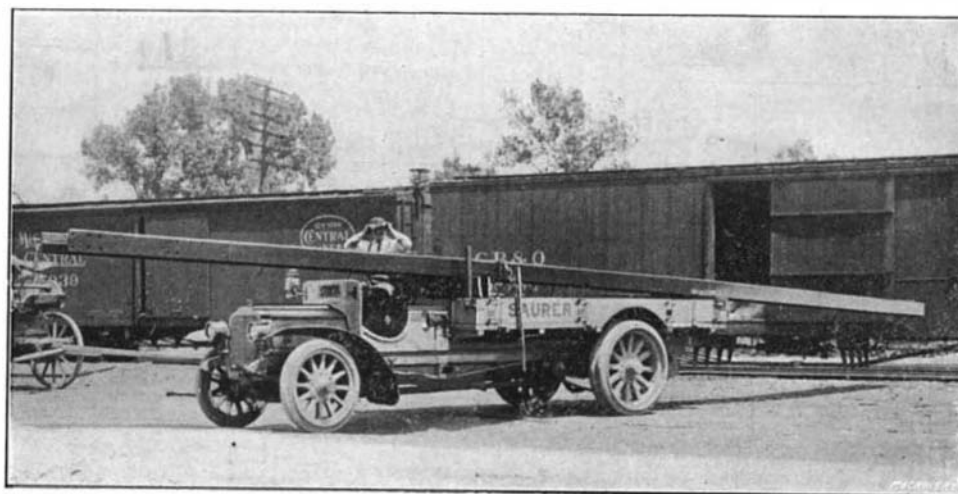


Fig. 4.—Six and One Half Ton Truck Hauling Long Steel Girders.

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be infrequent; and its design must be so simple that it may be handled and overhauled by the ordinary intelligent driver or machinist, thereby eliminating the expenses of high-priced help. The fulfillment of the first two of these conditions rests with the purchaser, with the co-operation of the manufacturer of the truck, while the last two depend upon the truck builder and

shipment and to bring back raw material on the return trip, conditions are nearly ideal, and such an installation should show a marked saving over any other ar-

rangement. In fact, an installation that will allow the truck to travel loaded in both directions is so obviously destined to be successful that the only ques-

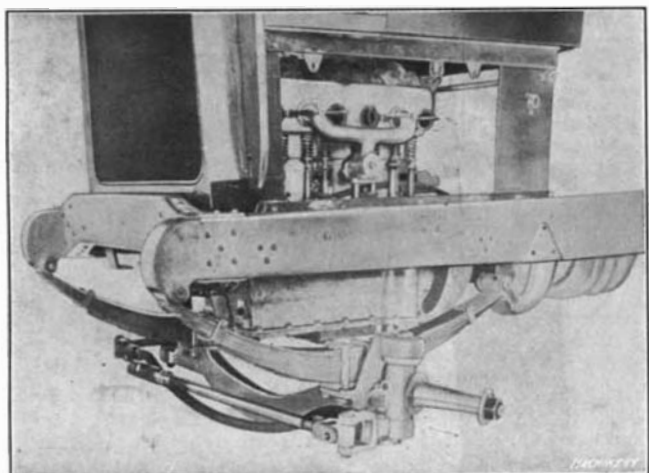


Fig. 5.—The Front of a 5-Ton Truck Chassis. All the Vital Parts Are Properly Protected in Case of Collision.

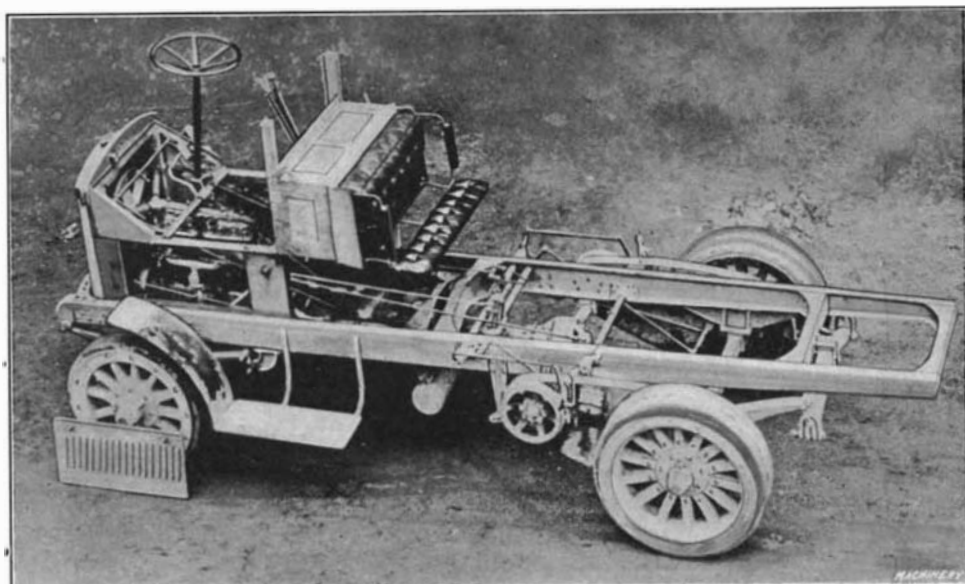


Fig. 6.—Chassis of a Five-ton Truck, Showing the Accessibility of the Motor Located Under the Driver's Seat, Which Can be Folded Back.

designer—but with the necessary co-operation of the purchaser.

The selection of a truck with regard to its capacity is an important consideration, but one too often overlooked. A 5-ton truck should not be purchased to conduct a 2-ton hauling business, unless expansion in the near future is to be provided for. To haul two tons in this case will cost nearly as much as to haul five, and such an installation would probably show a loss. Of course, it rests with the purchaser as to whether the expansion of this end of his business will, in the future, call for larger trucks, or a greater number of small vehicles, but the installation departments of the truck factories will help him with this problem.

While it is necessary that the trucks should be run fully loaded as much of the time as possible, the fact must not be overlooked that loads in excess of the capacity of the machine will cause the ton-mile hauling cost to increase rapidly. In fact, it is probable that to this tendency on the part of owners and drivers may be attributed the majority of the failures of commercial vehicle installations. By a constant 25 per cent overload, the life of the tires may be reduced by two thirds.

Inasmuch as a high mileage is essential to efficient motor truck operation there should be as little delay as possible in loading and unloading, and trips and routes should be so arranged that the truck may be given an opportunity to take advantage of its speed and large territory-covering ability. But even though the area to be covered by the truck might, of necessity, be restricted to the factory yard, the use of special loading and unloading devices may easily overcome what would otherwise be serious obstacles to an efficient installation. If the factory is situated some distance from the freight yards, and the truck can be utilized to carry the finished products to the point of



Fig. 7.—A Good Example of the Load That Can Be Put on a 5-Ton Truck.

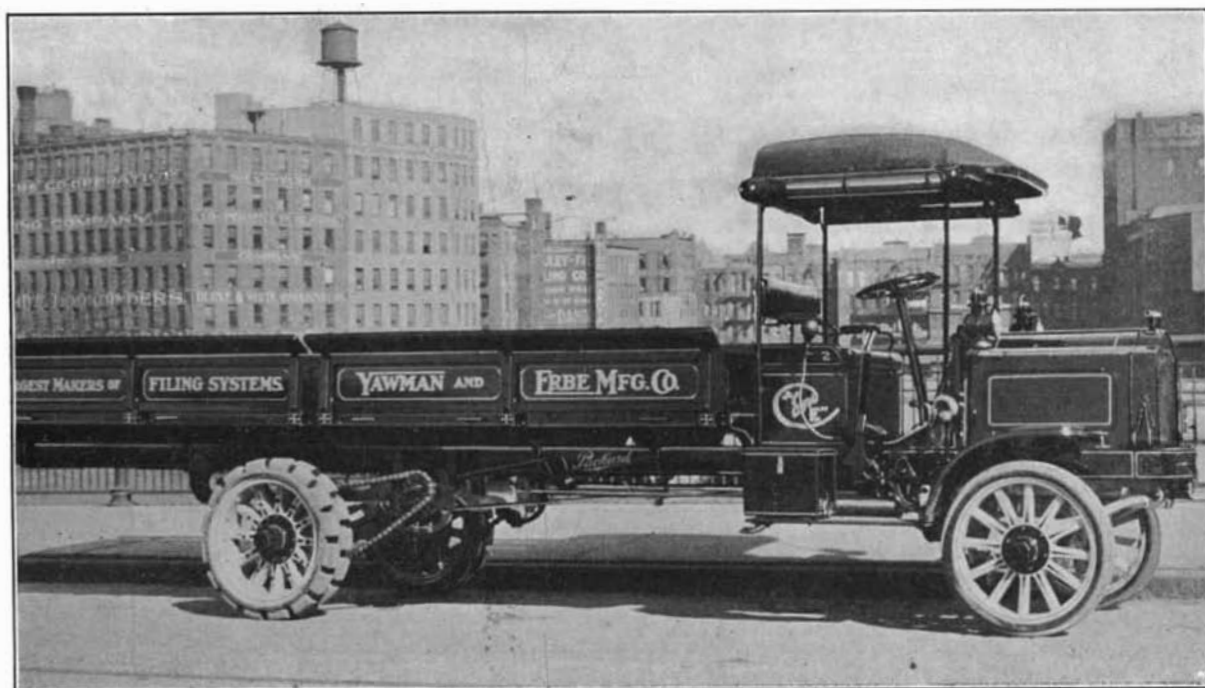


Fig. 8.—Truck With Long Overhanging Body at the Rear, Facilitating Loading at a Platform. This Truck Does the Work of Four Teams of Horses at an Average Cost of \$9.92 per Day, or at a Saving of About \$10.

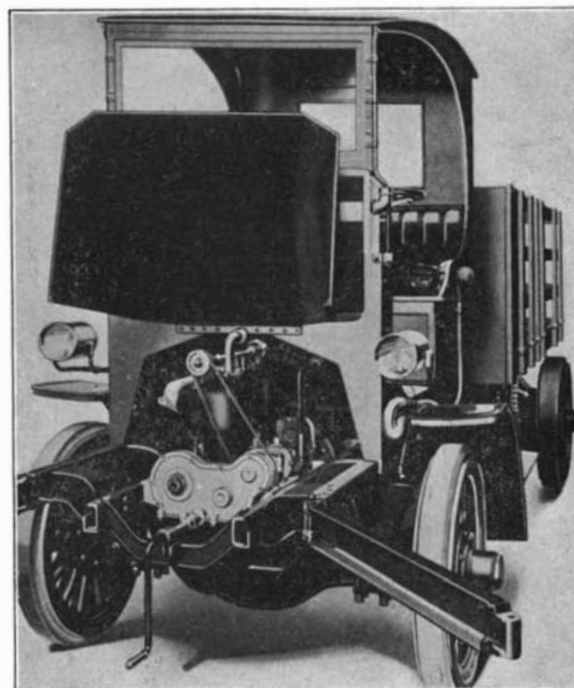


Fig. 9.—Removable Power Plant of an Auto Truck, Ready to Be Slid Out of the Chassis.



tion to be considered is as to which of the many trucks on the market would be best adapted for the particular requirements of the business. Many manufacturing businesses employ one or more trucks to do "odd jobs" around the yard. As work of this type will consist, probably, in moving heavy machinery or other material, and in traveling under load from one building to another, trucks used for this purpose should show good returns on their investment.

The very multitude of chassis sizes and types and body designs from which the purchaser may choose is striking evidence of the variety of purposes to which the motor truck may be put. Special bodies may be obtained to meet certain requirements, and these may be mounted on any size or type of chassis. It is probable that the average manufacturer will find the conventional stake body the type best suited to his needs. This may be mounted on a chassis of the ordinary length when heavy loads are to be carried, or on a chassis of extra-long wheelbase if its regular load is to be bulky or long.

It is not, however, only because of the unusual opportunity to run loaded a large part of the time that a truck will appear to unusually good advantage when used in a manufacturing business. The fact that a motor truck is a *machine* indicates that it will be well cared for, and that unusual facilities will be already at hand for its overhauling and repair. Probably every tool that would be used in a complete garage and repair shop will be found in the average large factory. There will probably be a large force of men familiar

available for service. To-day, through better management of the installation, as well as through improved design, the average percentage of idle trucks has been reduced to about two. Some builders have provided removable power plants that can be used to replace the engine that requires overhauling. These power plants are of the "unit" type and include, besides the motor, the clutch, transmission, and, in some cases, the radiator and all electrical equipment. These parts are all attached to the motor or its base and the entire power plant may be lifted out after the removal of two or three bolts. Thus, by the use of but one extra removable power plant, nine or ten trucks may be kept in practically continuous service, and yet each motor may be thoroughly overhauled as often as necessary.

The unit power plant, which includes the transmission mounted on an extension of the motor base, is not used on the majority of heavy trucks—although some of two, three, and even five-ton capacity will be found so designed. The average five-ton truck is chain-driven from two sprockets mounted at each end of a jack-shaft extending from the transmission case and located about in the middle of the frame. There is at least one notable exception to this design, however, in the form of a shaft-driven five-ton truck that employs a worm and gear for transferring the power from the propeller shaft to the floating rear axle. Practically all of the trucks having a capacity of over three tons use the twin, or dual, solid tires on the rear wheels. Such a wheel is provided with one set of spokes, but possesses two rims, thus giving the effect

ways of handling even the most invulnerable truck; and many designers have bent their efforts toward eliminating all possible sources of abuse. In some, the spark control lever has been removed and a fixed point of ignition used in its stead, so that the driver cannot run the motor at slow speeds and with closed throttle when the spark is advanced. On other trucks, an automatic spark advance and retard has been installed by means of which the speed at which the motor is operated regulates the point of ignition. In still another design, a spark lever has been used, but instead of placing this on the steering wheel—as is usually the case—it has been located on the dash where it cannot be reached as easily by the driver as can the throttle. It is assumed that there will be less temptation to "monkey" with the spark if the lever is not so conveniently located.

Although some of the heavy trucks are provided with planetary transmission, the majority employ the sliding type with either the selective or progressive method of shifting—the latter being in the majority. Modern transmission gears are so accurately cut and are made of special steels of so high a grade that it seems well-nigh impossible to "strip" them. As an added precaution, however, some trucks are provided with special devices which render abuse in this direction impossible. On one such device, the gears are in mesh at all times and each is provided with an individual clutch. The gear control lever is used to engage the various clutches, and thus the different speeds are obtained without any actual sliding or clashing of the gears, and the changes may be made without releasing the main clutch. Other designs employ a notched quadrant which prevents the movement of the gear-shifting lever until the main clutch is disengaged. Still a third system allows the gear-shifting lever to be moved, but the gears themselves are not slid into position until the clutch is released. This action is obtained by means of a bar cam which brings the tension of a spring into play against the gear to be moved. A back-cut on the jaws of the positive clutch with which each gear is provided, however, prevents the movement of any of them while the jack-shaft is revolving, and as this jack-shaft will continue to turn as long as the main driving clutch is engaged, the gears cannot be changed until conditions are proper for the shifting.

From 60 to 80 per cent of the load on the modern motor truck is carried over the rear wheels. This insures effective traction and enables the truck to negotiate slippery roads and steep hills with comparative ease. Designers are realizing that, because of its surroundings and the nature of its work, the average motor truck will be subjected to many a hard knock from exterior sources, in addition to those it may receive at the hands of a careless driver. Consequently all vulnerable parts are protected as far as possible from contact with any obstacle which the heavier portions of the truck might strike. For example, a heavy cross-member may be riveted to the forward portion of the frame to serve as a guard for the more delicate radiator, and all of the motor, transmission and protruding shafts or studs may rest within the confines of the frame proper. On some trucks, the motor sub-frame and radiator are mounted on separate springs to relieve these parts of the shocks and jars of travel that will not be absorbed by the heaviest body springs.

In fact, the modern truck is so well designed and constructed, and there is such a variety of body and chassis types and sizes from which to choose, that the blame for an unsuccessful installation may generally be laid to the purchaser of the truck and his system, rather than to the builder. There are, of course, many problems to be met and changes to consider, but each problem can be solved and all difficulties overcome especially well in a manufacturing business.

### Method of Recording Finger Prints

HITHERTO it has been customary, in following up criminal clues, to make a permanent record of finger prints by photographic means. This method, however, has a number of obvious disadvantages. Thus, for example, cases arise in which the finger print to be recorded is not accessible to an ordinary camera. Or again, it may be located upon some rounded surface which cannot be properly focused. In a recent number of *Umschau* Dr. Heindl describes one or two new methods which overcome these difficulties. The first method consists in dusting the impression—which is always more or less greasy—with some colored powder, and then pressing against it a paper treated with a mixture of fifty grammes wax, fifty grammes paraffine and twenty drops of glycerine. A very excellent inverted copy is thus obtained, and as the paper is entirely flexible, any kind of a surface can be thus treated.

The second method makes use of photographic gelatine paper in place of that prepared as above.

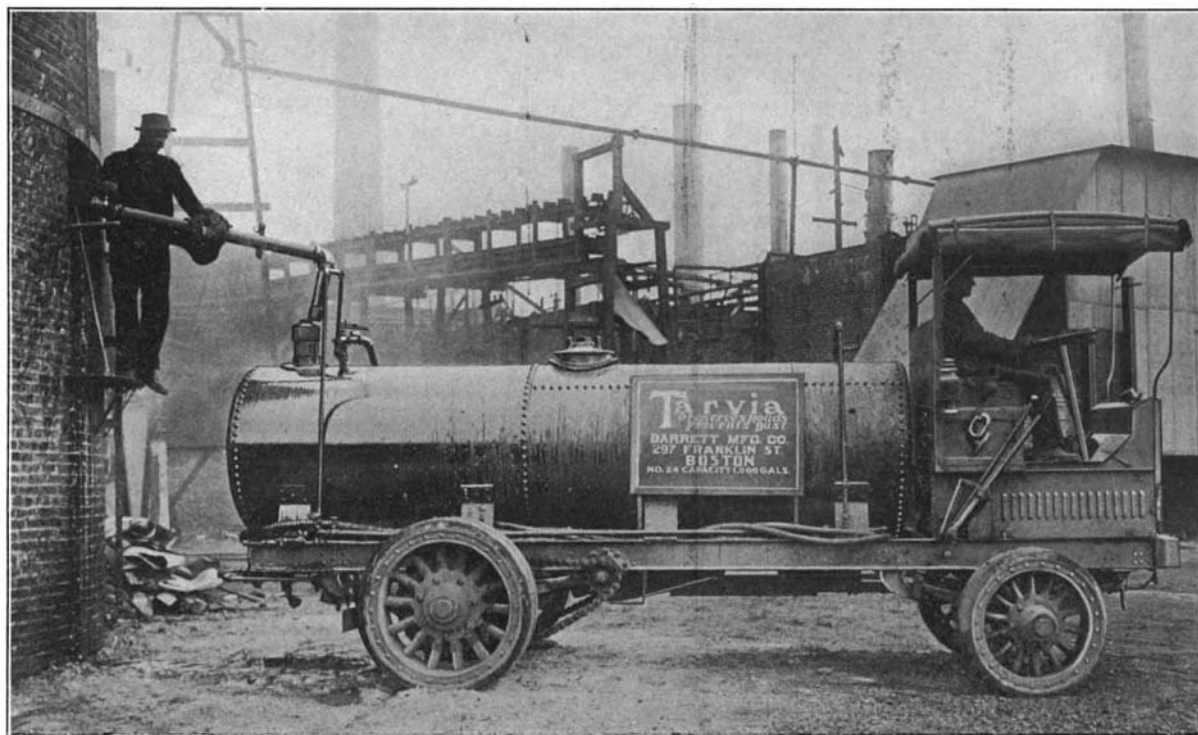


Fig. 10.—Tank Truck Used for Spraying Dust-laying Oil on Roads.

with all kinds of machinery, and consequently the motor truck will not be the "strange creature" that would be the case were it replacing the horse transportation system of many another line of business. This enables the factory to retain its old drivers. Thus, a complete garage and repair shop may be installed and equipped in the factory yard at but little additional expense, and the attendant saving in storage and overhauling charges will represent a large item. If the truck installation consists of but one vehicle, it may be advisable for a time, at least, to store the machine in a public garage, but even this will not bring the expense above that figured for a 5-ton truck in a preceding paragraph, as this charge was included in the estimate.

If the equipment consists of three or more trucks, it will undoubtedly prove advisable to equip a private garage and employ an expert whose sole duty shall consist in overhauling the vehicles and keeping them in perfect repair. In this case the drivers need only understand the control of the car, and are not required to be experts themselves. Consequently, a considerable saving may be made in chauffeurs' wages, and this forms the third advantage to be found in a motor truck installation in a manufacturing business.

The question of service is naturally an important consideration. No matter how well constructed a motor truck may be, it will require a certain amount of care and attention, and the engine must be overhauled occasionally. If several trucks are used, much of this work may be done at night, and if the power plants are thus kept continually in the top-notch of condition, there need be but little fear of interference with their work during the day. It was not long ago that, in large installations, one truck in every ten was used as a reserve machine. In other words, it was assumed that only 90 per cent of the trucks would be

of an exceedingly wide tire. Instead of using one wide tire on each wheel, however, two narrower tires are mounted on the single felly.

The power plants of the larger trucks are similar to many of those used on the high-power touring cars. The ordinary 5 or 10-ton truck is generally driven by a 30 or 40 horse-power motor located in the forward portion of the chassis, either under a conventional bonnet or under the driver's seat. In the latter design, the seat tips back or to the side in order to render the motor easily accessible. The gear ratios of the truck are much higher than are those of the pleasure car employing a power plant of equal size, for the speed of a 5-ton truck should not exceed 12 miles an hour, while that of one of 10 tons capacity should be restricted to 7 or 8 miles an hour. Some 3-ton trucks are designed to attain a maximum speed of 15 miles an hour—and even higher—but the governors used on the majority of the motors restrict their speed to about 1,200 revolutions per minute, and consequently the maximum speed of the truck will depend upon the gear ratios employed. On one truck, the governor is attached to the driving shaft, so that the speed of the car itself, rather than that of the motor, will be restricted.

It is evident that many designers have kept in mind the desire of truck owners to employ former horse drivers—or other men unskilled in handling a power vehicle—instead of expert chauffeurs, for the modern motor truck is of exceedingly "foolproof" construction. In fact, continued overloading constitutes about the only means—aside from downright vandalism—by which the average motor truck can be injured. By means of heat-treated and other special steels in the motor, transmission, and other parts of the frame and running gear subject to unusual strain or wear, the present-day truck can successfully withstand a remarkable amount of abuse; but there are right and wrong