

water, 1 liter (5.0). The total quantity of arsenic taken into the system per day thus figures very close to 0.021 milligramme, or about 0.0003 grain.

AUTOMOBILE STEEL SPECIALTIES.

BY GEORGE E. WALSH.

The manufacture of automobiles has reached such a stage of development that it proves a most important factor in the iron and steel trade. The millions of dollars invested in automobile plants indicate something of the growth of this special line of business. Already the tendency toward the standardization of the different parts of the automobile has progressed rapidly, and it may not be long before shops will be established for the mere assembling of the machines without any attempt to manufacture. Under existing conditions of patent rights and special manufacturing methods, it is possible to do this to-day without infringing upon the rights of others.

Automobile steel has called for special lines of manufacture and experiment that have proved of advantage to mills anxious to capture this trade. The amount of steel that goes into the ordinary automobile is variously estimated from $\frac{1}{4}$ to 1 ton, according to the size and capacity of the machine either for passenger or freight traffic. If the average is placed at 1,000 pounds, a manufacturing output of 5,000 machines a year would represent a total tonnage of 5,000,000 pounds of steel required for this particular line of industry. But this estimate is comparatively low, and within a year or two the plants will be turning out far more than this number. The orders at the last automobile exhibition in New York for new machines amounted to considerably more than a million dollars. With the average cost of a machine placed at a thousand dollars, this would represent over a thousand machines sold or ordered in one brief fortnight.

The iron and steel used in automobiles represents all degrees of hardness and strength. For the most part only the finest steel can enter into the manufacture of the driving part of the vehicle, and in the case of the high-power automobiles unusual strength of parts is required. In the specialization of parts there has grown up a line of steel manufacturing that is of peculiar interest.

The gears, chains, springs, and machine parts require steel so strong that it will stand the greatest resisting power. Extensive experiments have been carried on in some of the automobile plants with steel to test its qualities for the driving parts of the high-power automobiles. In one such series of tests over fifty tons of steel billets were destroyed to secure the most efficient results. As in the manufacture of high-power tool steel, there has been a gradual series of experiments that have virtually led up to the production of an article satisfactory to the trade. Most of the large automobile manufacturers have their own ideas of the kind and quality of steel they need, and the chemical tests and analyses show that they differ in the composition to only a slight degree. As the strength of the automobile must in the last analysis depend upon the quality of the steel used for the most important parts, it is quite evident that the manufacturers are justified in studying this problem exhaustively. In the former cheap grades of machines, the breakdowns were due to some inferior steel parts that would give way in critical moments under the stress of special strains imposed upon them.

The modern American automobile is nearly, if not quite, as strong, powerful, and durable as the best French machines, and it is due as much to the special manufacture of important steel parts as to the gradual perfection of boiler, engines, and electrical equipments. A good many of the manufacturers require air-hardened steel for parts that must be subjected to considerable strain and friction in the operation of the machines. The heating of the steel to a high temperature, and cooling suddenly in a blast of air, can give to the steel the desirable hardening qualities; but unless the compressed air-blast is sufficient to reduce the temperature of the steel uniformly and quickly there is always the danger of cracking and weakening of the parts.

As in the manufacture of steel for cutting tools and other high-grade purposes, there is a good deal of difference of opinion in the automobile trade as to the methods of obtaining the best steel for the machines. The application of water for reducing the temperature of the steel is employed differently in the various plants. There seems to be no absolute consensus of opinion in the trade regarding the exact treatment of the steel. A manufacturer who has had success with steel treated in one way cannot easily be induced to adopt any other method. He is slow to adopt new products of the steel trade.

Nevertheless, steel mills are not indifferent to the demands of the new trade. They have taken the matter up for serious consideration, and some of them are constantly carrying on tests for the benefit of the automobile trade, exhibiting to their customers the data thus obtained for their benefit. Thus in manufacturing the chains, sprocket wheels, and gearing of

the high-power automobiles, specially refined and annealed steel has been made, which will practically withstand any amount of strain that can be imposed upon it by even a forty-horse-power motor. This steel is not only chemically perfect, but it can be made in the most uniform manner. This latter point is one of great importance to the automobile manufacturers. A standard machine must be guaranteed in all particulars, and each successive machine must be up to the same standard. Any lack of uniformity in the steel parts would manifestly handicap the manufacturers in guaranteeing the durability of the machines.

The wear and tear on automobiles must necessarily be greater than on cars which run on smooth rails or tracks, and consequently the item of repairs has always been large. The life of an automobile has been short owing to the lack of uniformity of steel parts, but manufacturers to-day are willing to guarantee the life of the average machine to be nearly twenty per cent longer than that of the machine built five years ago. This is largely due to the superiority of the parts used, and their more perfect operation when in use. The quality of the steel employed has steadily enhanced the usefulness of the automobile, and also improved its power and durability.

The cost of manufacture is always an item of prime importance, and the temptation to use inferior steel parts to lessen the cost of manufacture is strong, but it must be said in all fairness that few of the responsible manufacturers of machines in this country are willing to sacrifice the reputation of their machines through any such short-sighted policy of false economy. The tendency is to use the best steel more and more, and to have every piece severely tested chemically and mechanically. The chemical test does not count for much in many plants, while special stress is placed upon the mechanical test. In other plants special emphasis is placed upon the chemical test, and all steel is immediately rejected that will not come up to the required chemical test. The later mechanical test is then applied to make sure of the accuracy of the first. The cost of maintaining a special laboratory for chemical and mechanical tests of all steel parts is quite considerable, and some of the plants are anxious to abolish it as a part of their equipment. But in their opinion this can only be done when manufacturers of steel will furnish them with a guaranteed uniform steel of certain qualities. Several of the steel plants are doing this to-day, furnishing elaborate data of chemical and mechanical tests with each piece of steel manufactured. These tests are open to the inspection of all, and the automobile manufacturers can any day assure themselves by personal inspection of the accuracy of the tests.

MUNICIPAL BAKERY EXPERIMENTS IN SICILY.

The British consul at Sicily, in his latest reports, supplies some interesting details concerning the experiments of the Palermo municipality with baking and supplying breadstuffs for the inhabitants. During the past few years, the flour trade of Palermo had been effectively cornered by one private establishment, and became practically a monopoly. It is estimated that the population of the city, which aggregates about 325,000 persons, consumes 260,000 pounds of bread and 110,000 pounds of macaroni daily. As the constituents of these staple foods were in the hands of one firm, the price of common bread was inflated to five cents per pound, thereby causing distress among the poorer classes of the city. Thereupon, in order to alleviate this suffering, the civic authorities decided to establish municipal bakeries.

In March, 1903, the system was inaugurated by the baking of some 20,000 pounds of bread daily. The success of the experiment necessitated the utilization of the military emergency ovens, capable of turning out 11,000 pounds of bread per diem. In May the municipality acquired a private flour mill on a two years' contract. This mill was of Italian construction. It employs 55 hands permanently, and 30 day laborers, and can turn out in 24 hours, working day and night, about 50 tons of flour. Attached to the mill is an old-fashioned bakery capable of producing 20,000 pounds of bread daily, and a modern bakery, which kneads the flour mechanically and produces 8,800 pounds of bread per diem. During the initial stages of this municipal venture, municipal officials were detailed to the work in almost all its branches, and the municipal police retailed the bread in huts placed in the principal streets. The sum of \$30,000 was set aside as capital for working the mill and bakery. The municipality actually produces some 44,000 pounds of bread daily—about a sixth of the daily consumption of the city of Palermo. It serves the purpose of maintaining the standard rates which the municipality considered equitable, and allowing a fair profit to the trade. The net result has been a reduction of the prices of the different qualities of bread by about one cent per pound.

The municipality retails its flour and by-products to the public. There are twenty-four shanties where the bread is sold by municipal guards, who receive, in

addition to their ordinary pay, a premium of two cents per five dollars of cash taken. When the shanties were first put up, a good deal of hostility was shown them. Private retail dealers are encouraged to take up the distribution of the bread. They pay all their expenses out of a profit of 15 cents per 200 pounds weight of bread, which is delivered to them free. At the present moment there are some thirty such retail dealers. The municipality is planning the erection of a flour mill capable of dealing with 300 tons of grain daily, and of a bakery which shall produce 26,500 pounds of bread, besides pastes, daily.

AUTOMOBILE NOTES.

In a crowded garage, there is often considerable difficulty in moving the vehicles around in getting them in and out of their places, and in order that this may be done with the least possible expense of floor space, a western manufacturer of accessories has made a roller device more like a roller skate than anything else, which is designed to be slipped under the wheels of the automobile, whereupon it may move around in its own length. A pair of these will answer all purposes and it is not necessary to have one of the devices under each wheel. The wheels on these are pivoted in the same manner as casters.

Among the recently introduced automobile accessories is a leather tire which comes from England and which is said to be much more serviceable and less expensive than the tires of rubber. The tire consists of an inner tube and shoe, with an additional shoe of leather. Over the running surface of the leather shoe is an auxiliary strip of leather fastened with a number of heavy rivets. The double ply of leather makes a very substantial tire, and the metal of the rivets is said to take a hold on the surface of the road, no matter what its character, that makes anything like an anti-skidding device quite unnecessary.

The Automobile Club of France announces that the next annual show will be held in the Grand Palais from the 9th to the 25th of December. In order to make this year's show especially brilliant the committee is organizing an annex show in the large Horticultural Building near by. Here will be found a series of veritable factories, which will give the public an idea of the successive phases of construction of an automobile car. Already numerous propositions have come in to the commission and no doubt many of the large firms will be represented. This will form an interesting feature of the show, and a most instructive one.

By the arrival in New York on October 7 of the 24-horse-power Columbia touring car, the Chicago-New York road record for the intervening distance of 1,127 miles was reduced to 58 hours and 45 minutes. The car was driven by H. H. Holcomb, Lawrence Duffy, and E. C. Bald, who alternated at the wheel. The best previous record, which was made a short time ago by Messrs. Ellis and Schmidt, of Chicago, in an Apperson car, was 72 hours, 36 minutes, so that the new record very materially reduces this. The last part of the journey was through the Catskill Mountains and was made through heavy showers; but not a mishap occurred then or throughout any of the trip. The test has shown well the endurance of the stock Columbia machine.

It would hardly seem likely that there would be any demand for a bucket capable of being carried in the pocket, but such a device has been recently placed on the market. The thing was primarily designed for the use of automobilists who require to take on a supply of water at regular intervals but it is also said to be a convenience to campers and tourists. The device is made of waterproofed material fastened to a jointed frame, and when it is desired to pack the thing in a small space, it can be folded up to a size about the same as a pocket hat. If it were necessary to carry the bucket in the pocket it could be done without trouble. Since putting the bucket on the market the manufacturers have made and are selling a small bathtub on precisely the same lines, which is said to be a great convenience in the nursery.

A new type of tire especially adapted for automobiles has been designed by a London inventor. Instead of a single inner air tube there are two, placed side by side on a steel rim. These are inclosed and protected by an outer head made of hard *papier maché* in sections of twelve or more. Each of these tread shields, as they are called, is attached to the rim of the wheel, by means of a bolt which has a free up and down movement, but has no lateral play. When all these shields are fixed in position, they constitute a kind of armor around the two air tubes. By this arrangement it is claimed punctures are rendered impossible, unless the *papier maché* is pierced, which, in view of its hard texture, is considered impossible. The heads, however, present a resilient surface to the road. Precautions against side slip are provided by means of links which are placed between each tread shield.