Cleaning Silverware

By L. V. Redman

THE discovery and recent perfecting of electric silver cleaners mark a distinct advance in the art of silver polishing.

Silver polishes and cleaners have consisted until very recently of materials which dissolve off the tarnish or cut it off by rubbing with fine powders. The black oxide or sulphide which forms as tarnish upon the surface of polished silver appears at first as a film so thin that it displays beautiful iridescent colors of purple and blue; the thickening of the film produces the black oxide color. Solvent polishes are composed of chemicals such as ammonia and cyanide of potash. These chemicals dissolve off the black coating and leave the silver a beautiful satin finish on the surface. The cyanide polishes are very poisonous and should be used only with the greatest caution.

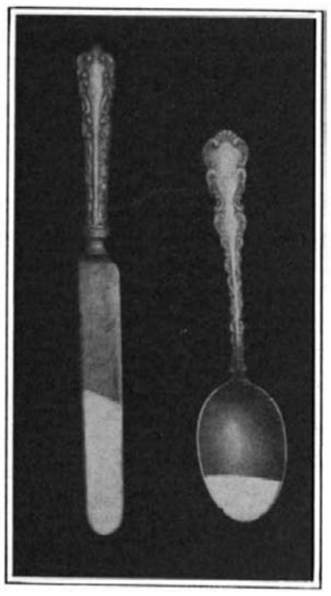
Abrasive polishes are composed of very fine powders and are designed to cut away the tarnish. The powders are very hard materials, such as, for example, tripoli, rouge, double floated silica, volcanic ash, kieselguhr, fuller's earth and pumice. Each particle as it passes over the surface of the silver cuts off a small part of the tarnish coat, the scratch being too small to be seen by the eye without the aid of the microscope. This method of cleaning silver is very wasteful, as it not only destroys the tarnish, but also destroys or wears away the silver. However, it is the only method which will give to silver that excellent, burnished shield effect, which at times is so much to be desired.

New electric silver polishes are being introduced to the public. They are designed to take advantage of the electric current which exists between two metals, when these metals are in contact with each other in water. The electric current, which is produced when two metals are in contact in water, is much stronger if an electrolyte like washing or baking soda or common salt be added to the water. The potential is further increased if the water be brought to boiling. Early attempts to make these polishes a commercial possibility were unsuccessful, for the metal used was tin. The water and soda were put in a tin pan and the liquid was brought to boiling. The silver articles to be cleaned were placed in the pan, immersed in the boiling water and in contact with the tin dish. When the pan is new the silver is cleaned rapidly, but the tin soon dies or becomes passive, that is, covered with an insoluble film of tin oxide, which will not conduct the electric current. Once the tin pan becomes passive, it is thrown away and a new one takes its place. The fault never lies with the powder. The powder is invariably soda or soda mixed with a little common table salt.

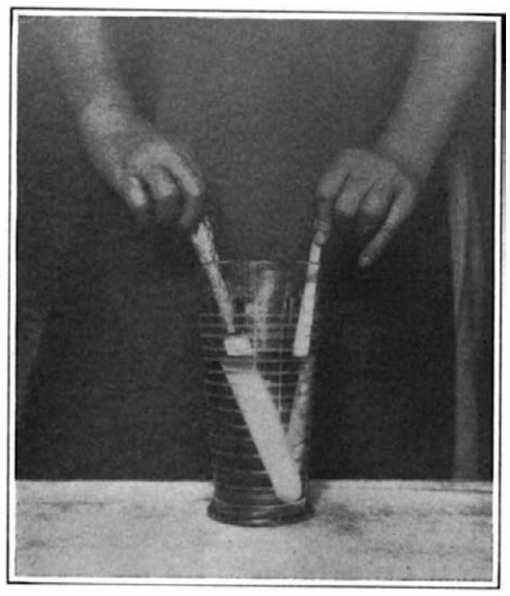
With the introduction of aluminium kitchen utensils another method was adopted for cleaning the silver. The aluminium dishes were used in place of the tin. The voltage is much higher between aluminium and silver; the cleaning of the silver is the matter of a moment if a spoonful of soda be added to the boiling water. The pan will clean the silver if the silver is left in cold water in the pan over night. However, this method of using aluminium utensils is not to be recommended, as the vessels are soon blackened on the inside and the aluminium ware is dissolved away by the soda and destroyed.

Aluminium dishes have been made and patented, for the special purpose of serving as silver cleaners. These boxes or pans are fitted at the bottom with rods of zinc which serve as an electric contact between the aluminium and the silver articles. The pans or boxes work fairly satisfactory, and because the zinc rods serve as conductors, they do not go passive or dead as the tin is inclined to do.

Another form of electric polish has been introduced into the market very recently which for cheapness and efficiency is at present unequaled. The powder is put in small packages and is accompanied by a sheet of metal which is an alloy of aluminium and other metals higher in the electric series. All that is needed is a vessel of granite, iron or tin in which water may be boiled. The powder is put into the boiling water and the sheet of metal is thrown in among the silver articles which are being cleaned. The only precaution necessary is to take care that the piece of metal is in contact with the silver. The cleaning is done in a moment and several pieces of silver may be cleaned at the same time. As soon as the cleaning is accomplished the metal should be taken out and washed in hot water and dried, if the best service is to be obtained from it. As these silver cleaners are composed only of washing soda and salt, there is nothing in them injurious to health. The silver after cleaning should be washed in pure hot water and dried, otherwise it may have a slightly yellow color and taste bitter or brassy. These effects are due to the soda which remains upon the surface of the silver and tarnishes it yellow. These electric polishes do not dissolve the tarnish of silver as ammonia and cyanides do. Nor do they wear off the coating of black as the rubbing powders do. The blackened silver is actually reduced to bright metallic silver by this method and is replated upon the silver article. Thus the silver surface is preserved and the life of the silverware prolonged indefinitely by this treatment. Laboratory tests have shown that silver vessels placed in sulphur or sulphides until the silver is blackened and then cleaned by this electrolytic method, do not lose enough silver in one hundred treatments to be detected with a scale which weighs accurately to one two hundred and fifty thousandths of an ounce. The rapidity of the cleaning, the simplicity and the cheapness of the method, and the saving on the silver, should recommend the method to every one interested in silver cleaning.



Tarnished silver partly cleaned by electrolytic process.



Cleaning a knife by immersing it with an aluminium rod in a hot soda and salt solution.

An Electrical Automobile Transmission System

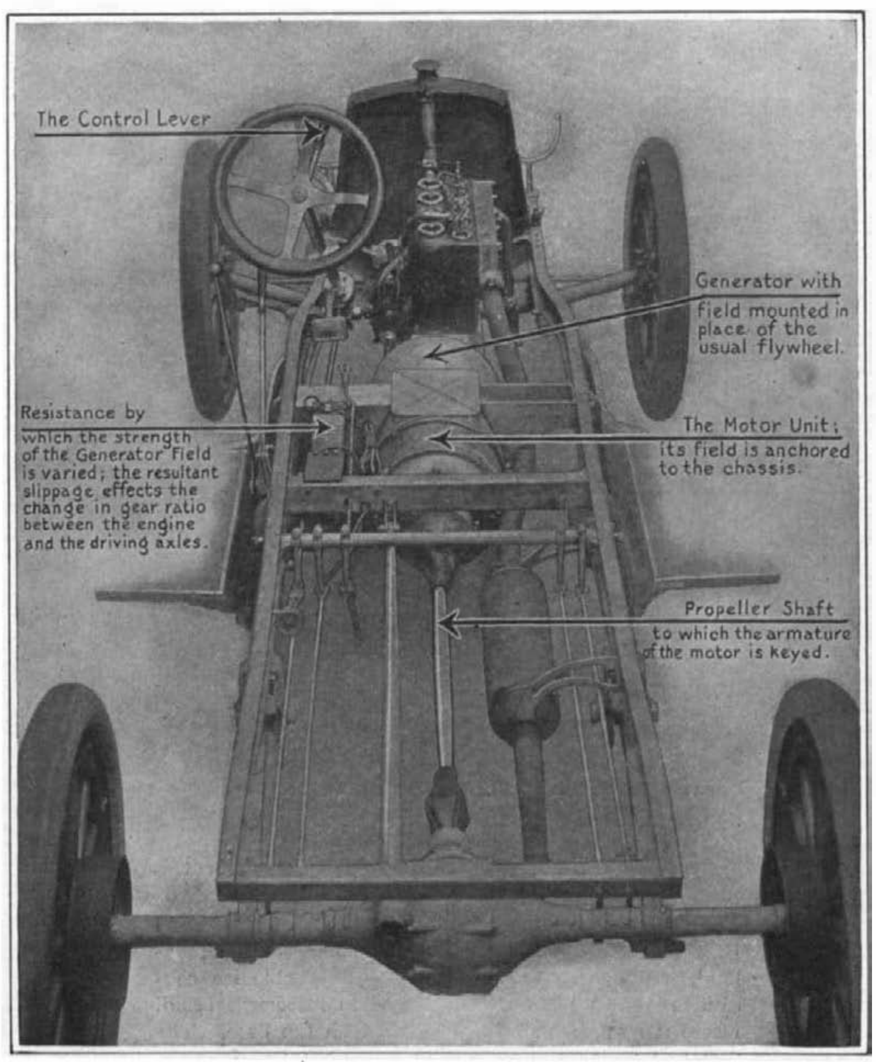
By Ross Babcock, M.E.

THERE appeared at the recent automobile show in Grand Central Palace in New York a radically new type of electric automobile transmission. Aside from performing the functions now performed by the latter-day type of electric engine starting system, the new apparatus eliminates the usual type of master clutch between the engine and the remainder of the propelling mechanism as well as change gear set and engine flywheel. Thus it substitutes for clutch and gearset and flywheel and engine starter and their various controls, a single unit with a single moving part and one control lever. With that single control lever it is possible to obtain seven variations of ratio between the speed of the engine crankshaft and that of the driving axles.

In its simplest aspect, the new system consists of a compact generator, a series-wound motor unit and an 18-volt, 35-ampere hour storage battery. The battery can be eliminated, for no reliance is placed upon it for the operation of the transmission; it serves merely as a source of current for starting the engine and for carrying the lamp load as in the ordinary electric lighting and engine starting system.

The generator portion of the system has its field mounted in place of the usual engine flywheel which thus is eliminated. The armature is keyed fast to the propeller shaft. The motor unit is mounted just back of the generator with its armature also keyed to the propeller shaft, but with its field securely anchored to the chassis frame. The whole, generator and motor, is completely inclosed in a tight aluminium housing, as is shown by the accompanying illustration, and therefore is thoroughly protected from the insidious action of dirt and moisture and from accidental injury.

The principle of operation can be described briefly as magnetic drag. When the engine is started, the rotating field of the generator exerts a certain drag upon the armature which thus is rotated, carrying with it the propeller shaft and moving the car. The slippage between the field and the armature of the generator is controlled by the simple expedient of varying the strength of the field partly with the aid of resistance, and it is this slippage that affords the change in gear ratio between the engine and the driving axles. Obviously, the slippage results in the generation of a certain amount of current which ordinarily would have to be absorbed by resistance and thus be lost in heat. It is here, however, that the motor unit assumes the place of importance it occupies in the system. Instead of being lost in resistance, the generated current is passed to the motor, which thus becomes a source of energy and assists in propelling the car.



This electrical transmission performs all the functions of an automobile engine starter and eliminates the clutch, changes gear set and flywheel.

When the car is first started—with the control lever in the first speed position—the slippage is at its maximum and hence the maximum amount of current is passed to the motor, the result being that we have a comparatively high torque for starting when it is most needed. As the speeds are "notched up," the motor gradually is cut out of the circuit until at what in the average automobile corresponds to high gear, the motor is virtually dead.

With regard to the amount of slippage that takes place at what may be termed the "high gear" position—and hence the efficiency of the mechanism—it is stated that with the engine crank-shaft rotating at 1,000 revolutions a minute, the speed of the armature will be approximately 960 revolutions a minute. In other words, with the car running on a level road, there is a loss of about 40 revolutions a minute between field and armature. On steep hills, or in sand or mud the slippage may be expected to increase slightly. A fair average would place the efficiency at from 93 to 96 per cent.

As there is no mechanical connection between the engine and the propeller shaft it is evident that an extreme degree of flexibility in the drive must result; it is impossible for engine impulses to be transmitted—a car will run as smoothly, in fact, with three of its four cylinders working as it will with them all firing—

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An Electrical Automobile Transmission System

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and constant torque on the propeller shaft is practically obtained.

Obviously, the functions carried out in driving the car can in a measure be reversed when the car is coasting with the engine running free. In this case the electric transmission then operates as an efficient brake in which there is nothing to wear. It will hold the speed of the car down to approximately 10 miles an hour on any grade where traction is obtainable.

The operation of starting the motor scarcely can require explanation. Current is drawn from the storage battery and passed to the field of the generator. Normally this would cause the armature to rotate and the car would be propelled backward. But when the brake is set, locking the propeller shaft, the field then rotates about the armature, and thus starts the engine. The electric motor serves a secondary purpose. When the car is driven on what corresponds to high gear, it furnishes current to maintain the battery in a charged condition, the current supplied being at the rate of about 10 amperes. When the car is standing, connections can be established with the control lever which will give a charging rate of up to 30 amperes, this rate being useful after the car has remained idle for a long time or for emergency.

The system is not untried, for it has been in use in a car that has been driven for upward of 16,000 miles over roads good, bad and indifferent, practically all over the United States; incidentally, that its efficiency really is as stated is demonstrated by the fact that the gasoline consumption of the car was no higher than that of the ordinary car.

The Gyroscope in China

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Fig. 4. Considering the motion about the axis *ce*, the motion of the particles in the quadrants are now shown by the position of the black beads, and we quickly arrive at the same conclusion; that the force *n* will develop a similar force *o*. A natural question at this point is: But since the shaft appears to move around in a horizontal circle, its rim does not move out as indicated in the different quadrants. How then can it develop the forces indicated? It is a good question. The answer is that the wheel rim does move out just as assumed. The proof may be had by making an enlarged photograph of the path of the free end of the shaft, and it will be found that it is made of a series of spiral loops. If *a* represents the force of gravity, *o* will be equal to it in an opposite direction, thus preventing its falling; and the experimental proof of this is the fact that such a wheel does not fall, but moves off at right angles to the direction of this force, in the direction *n*.

This gyroscope *c*, Fig. 2, also serves to illustrate one aspect of the gyroscope as a compass. If after it is spun up, the shaft is placed in a north and south position so that the large ball is pointing toward the north, and it be lifted up by means of the cord attached to the fulcrum at the center of the lever, it may be carried all about the room and swung round several times in each direction, and taken back to the stage, when it will be observed not to have departed from the north and south direction during its journey. This of course does not go into a deep explanation of how the centrifugal force due to the earth's rotation is made to act on a delicate gyroscope to cause it to take up a position so that its axis will be parallel to that of the earth, nor does it explain how the corrections are made due to the forces developed by the motion of the ship carrying it. But it does go a long way toward giving a popular audience an impression of its possibilities in that direction, as in the compass so skillfully worked by Mr. E. S. Sperry in America and others in other parts of the world. (See Fig. 2.)

Of very great interest also is the gyroscope shown at *D* in Fig. 2. This gyroscope has extended shafts on the horizontal side rings. It is first used without the stilts shown underneath it in the picture. The legs that are extended into sockets at the top of the stilts are sharp. When spun up it balances perfectly on these sharp legs. A weight is added to the cup shown at the side of the frame; instead of sinking down, the side where the weight is applied actually rises. This is due to the fact that in order to stand it must keep its center of gravity over the point of support. The only way to do this is by elevating the side upon which the weight is applied. In Mr. Brennan's monorail car, a large party may stand on one side, then rush in a mass to the other, resulting, not in depressing, but in raising the side to which they go.

This explains also why in rounding a curve the car tips up on the outer side in proportion to the speed and radius of the curve, so that to occupants it is as though the car were traveling in a straight line with the floor level. This is illustrated in this model by replacing the sharp legs by grooved wheels which are capable of running on a wire stretched in the air or laid on the floor as a track. This improvised monorail car will balance itself on such a wire even through a considerable weight is applied to one side or the other. The wire may be swung back and forth, but still it retains its balance without difficulty. After the experiments have been made in this way, the stilts as shown in Fig. 2 are then added, and even though they are high in proportion to the size of the gyroscope it is able to stand up and even run on the wire when the grooved wheels are placed at the bottom of the stilts.

The rule above stated is capable of giving a very quick and practical solution of many gyroscope problems; for example, let us apply it to the case of the "wrestling" gyroscope, Fig. 5. This and several other pieces of apparatus used in this article were constructed by Mr. M. M. Wood of Berwin, Ill.

The wrestling gyroscope has been one of the very popular features of the gyroscope lectures in China. Its construction is readily understood by reference to Fig. 6. It consists of a strong bicycle wheel with the rim loaded with lead pipe and then wound with spring brass wire. When spun up to high speed and the case closed and set upon its edge, as shown in Fig. 5, it will stand up with a slight list to one side, and will precess slowly around on a nearly vertical axis. A member of the audience is invited to use a strong staff padded at one end with a solid rubber ball and make the wheel lie down on its side. (See cover illustration.) Any attack upon it above the middle develops a powerful and instantaneous reaction; and unbelievable as it may seem, it is nevertheless a fact that the strongest man is unable to push it over. This experiment delights the audience, and after two men have joined hands and been unable to push the gyroscope over, the audience is willing to accept the statement that a fairly light wheel running at a comparatively slow speed is able to develop a very heavy reaction. The audience then also readily comprehends how it may be possible for a wheel weighing tons and running thousands of revolutions per minute, to furnish a basis for stabilizing a monorail car or opposing the rocking of a ship.

Now how does the precession rule apply in such a case as the wrestling gyroscope shown in Fig. 5? It is seen that the case leans slightly toward and to the left of the reader. The force that is acting upon it is its own weight, which may be represented by a downward force from the ring represented by the arrow *a*. Now if the bottom of the wheel is traveling from the reader, the application of the rule (rotate the force *a* 90 degrees with the wheel) would result in the arrow *a* being rotated to point in the direction *n*. This would cause precession, due to the force *n*, and would result (by a second application of the rule) in the development of a force *o* which would counteract the gravity tendency at *a* and prevent the wheel's falling. Now suppose that a heavy external force is applied, as represented by the arrow *p*. The effect of this would be roughly speak-

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