NON-SKIDDING TIRES AND PROTECTIVE BANDS FOR USE ON THE WHEELS OF AUTOMOBILES.

One of the greatest difficulties that the automobilist has to contend with is the skidding or side-slipping of tires upon muddy roads. In cities, where asphalt pavement is now generally used, skidding is particularly dangerous, while even on a good macadam road it is perilous if, when traveling at a very high speed, the brakes are suddenly applied. What may happen under such circumstances is clearly shown in one of our illustrations, which depicts one of the Napier racers that successfully ran through the English eliminating trials for the Bennett cup race (which were held recently on the Isle of Man), and then came to grief by skidding into a stone wall because its driver had suddenly applied the brakes when he was going very fast.

In order to determine which is the best non-skidding tire or detachable protective band, the Automobile Club of Seine and Oise, France, held a test this spring. Two of our illustrations show the appearance of the two types of tires—the Gallus "ferré" and "demi-ferré"—which won the greatest number of points. These tires have been on the market in France for several years, and it is not the first time that they have received awards. The cross-sectional view of a tire shows the Gallus "ferré." This tire has a flat tread with layers of canvas on either side of its center point. To this flat tread are riveted steel plates spaced a short distance apart. The tire, which is detachable, also has steel plates fastened to it on the outside of the bottom flanges for the purpose of preventing it from being cut by the wheel rim.

The other illustration shows the general appearance and a cross-section of the Gallus "demi-ferré" band. This band is of rubber and is cemented around the tire. In the center there is vulcanized to it a narrow rubber strip containing, near each side, tough cords. Steel plates are clamped around the sides of this strip and are spaced about their own width apart. The spaces of pure rubber between the steel plates make the band quite pliant and easy-riding, while the part of it protected by the plates is puncture-proof. The rubber spaces keep the tire from slipping on dry pavement, and the steel plates do the same on wet. Fast speeds and sudden stops can therefore be made on any road without danger of skidding.

Following the tests above mentioned, which were made at Versailles on a short stretch of muddy road, an endurance test of about 900 miles from Paris to Nice and return was given several different kinds of non-skidding tires, all of which held up very well. As a result of these tests, the following points were determined regarding this type of tire, or protective band: (1) Dry leather is not suitable for this purpose, since it cracks after having been wet. Leather having considerable natural grease in should be used.

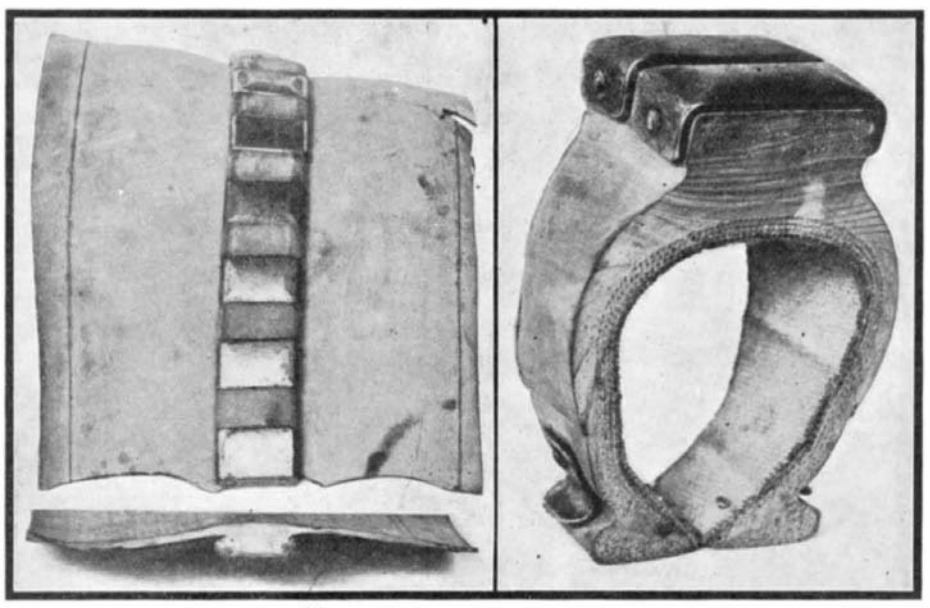
(2) Rivets must be securely fastened in place without washers, in order to avoid cutting out.

(3) With regard to the detachable protective bands, these should be fastened to the rim of the wheel at as many points as possible, if, indeed, it is not found desirable to fasten the edges to iron rings attached to the spokes on either side of the wheel. During the long-distance tests, the inconveniences of insufficient fastening of the protective band became apparent, since the side pull on the band every time there is a tendency to side-slip, is apt to cause the attaching strips to stretch and the band to slip to one side of the center of the tread.

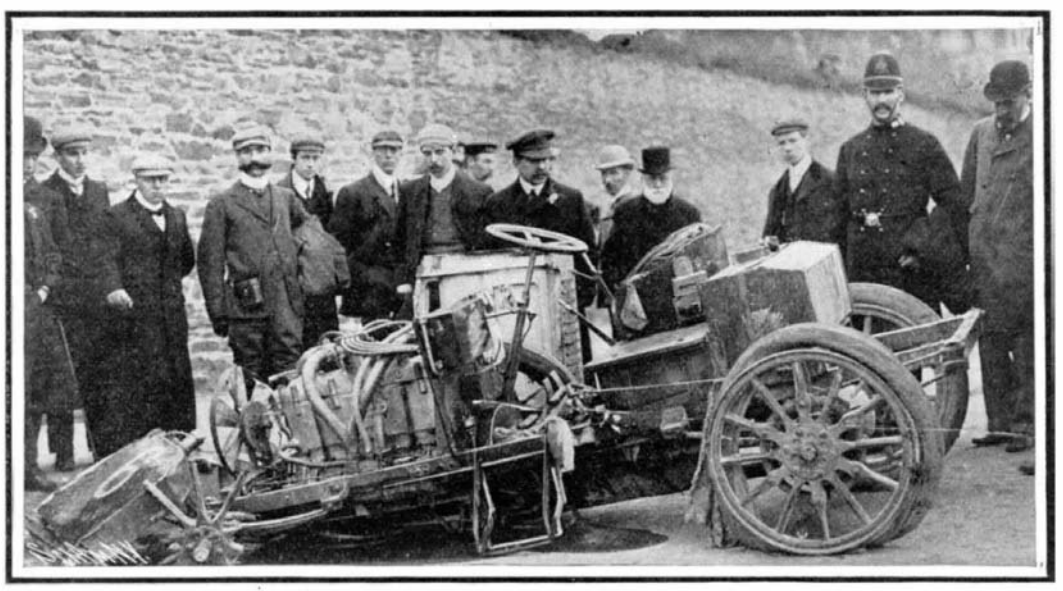
(4) The protectors for the steering wheels have to fulfill other requirements than those on the driving wheels. The necessity of making the former retain the lateral play necessary to good steering requires the use of protective bands without any pads or transverse strips such as so efficaciously prevent the vehicle from side-slipping when applied to the rear wheels.

The objection has been raised that the non-skidding tire or band absorbs considerable power, and that consequently a machine equipped with them cannot be run as fast as when using ordinary pneumatics. Tests with both kinds of tires on an electric automobile showed that, for speeds above 18.63 miles an hour, the resistance to rotation of pneumatic-tired wheels is sensibly the same whether a plain pneumatic or a protected, or anti-skid, pneumatic tire is used. At speeds below 18.63 miles an hour, there is a difference which becomes greater as the speed lessens, plates of steel placed near together and riveted to a leather band offering, according to the experiments, more resistance to deformation than any of the other systems.

Some similar trials of non-skidding tires have been held recently by the Automobile Club of Great Britain and Ireland. In this case a 1,000-mile endurance test was first given the tires, after which tests were made as to their non-skidding abilities on ground covered with soft soap. The report of this test has not yet been made. An illustrated description of various non-skidding tires will be found in Supplement No. 1474.



The Gallus Non-Skid Band. The Gallus Protected Tire.



A Napier 100-Horse-Power Racer Damaged in a Skidding Accident.

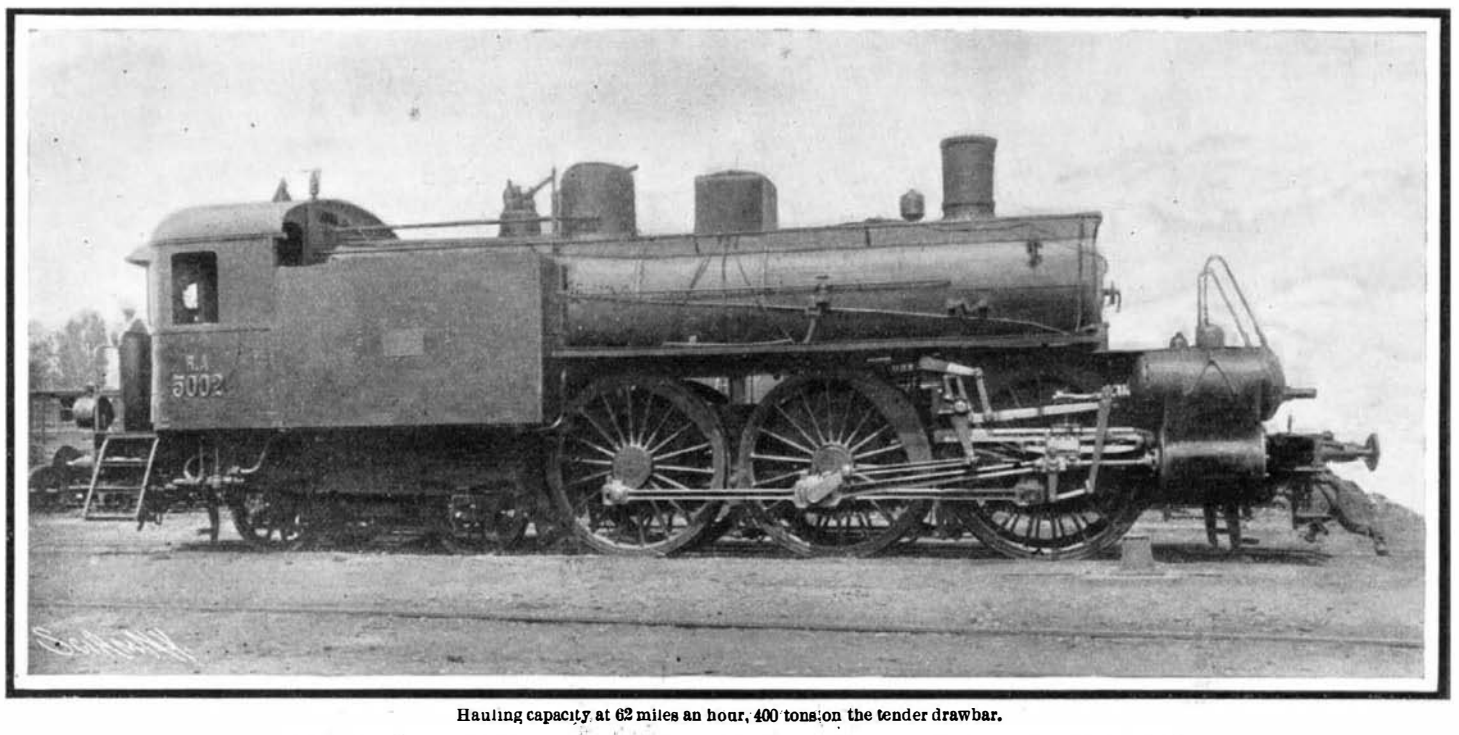
PRIZE NON-SKIDDING TIRES IN THE FRENCH TEST.

SUCCESSFUL ITALIAN EXPRESS COMPOUND LOCOMOTIVE.

BY CHARLES R. KING.

The locomotive shown by the accompanying illustration is one of the most interesting of all highly successful modern locomotives. It would be difficult to find another engine, anywhere, which worked with an equal economy in fuel at equal speeds and equal loads per ton of locomotive dead weight—not simply for a single run, but for the closely-checked average results obtained in the course of a whole year. Its chief peculiarity of appearance is that it is a "front-header," both enginemen riding over the pilot under immensely increased advantages for safe operation of engine and traffic alike. This new location of the cab, as in electric locomotors, was, however, only a consequence, and not the object in building a locomotive with this arrangement. Had this engine, with its wide firebox, been mounted over the driving wheels, the boiler top would have been raised to the actual height of the smokestack, and in consequence there could have been no such projections as chimney or valves on top. To have adopted the usual arrangement, the four-wheeled pilot would have been placed in front, where its purpose would have been to carry the weight required for the connected wheels' adhesion—a useless addition, therefore—and then a four-wheel truck or an overloaded trailing axle would have been necessary below the firebox. Under these conditions it was preferable to place the four-wheeled truck where it would be useful, and then profit by the new position of the truck to run with the firebox leading. This was done, and the results on every point have since proved that this locomotive is indicated as the ultimate type which will meet the conditions of every railway where the size of the locomotive has reached the last limit in the constructional gage.

The new locomotives, belonging to the Rete Adriatica a Meridionali Railroads of Italy, haul the greatest express loads in the whole continent of Europe, and in excess of anything known outside of America. And weight for weight in locomotives (*compound* locomotives) their capacity to haul five



Hauling capacity at 62 miles an hour, 400 tons on the tender drawbar.

AN ITALIAN FOUR-CYLINDER EXPRESS COMPOUND LOCOMOTIVE "ADRIATIC" TYPE.

times their own average working weight of useful load at from 50 to 60 miles per hour is scarcely likely to have an equal even in the United States, leaving aside the question of coal economy. This is equal to saying —and any contradiction thereto would be exceedingly interesting and therefore welcome—that for a given number of thermal units expended these Italian engines pull more weight at a given speed than any other locomotive in the world. Thermal units are mentioned, and not coal quantities—than which nothing more misleading could ever be introduced in the estimate of a locomotive's fuel-value consumption, unless the caloric value of the coals actually used is reliably given.

These engines were designed for all speeds up to 82 miles per hour, but the state of Italian tracks and works prohibits more than 56½ miles per hour; but the writer has sometimes seen the tachograph recording 62 miles per hour with 400 tons on the tender drawbar; that is to say, 440 U. S. tons; or with the engine fully loaded, a gross load of over 550 U. S. tons. In freight service they pull gross loads of up to 1,030 U. S. tons.

The "Adriatic" compound system comprises four cylinders—two high-pressure on one side and two low-pressure on the opposite side of the locomotive—each pair having only one piston-valve operated by one valve-gear—Walschaert's.

With this arrangement of one valve distributing to the high-pressure and one to the low-pressure, it is possible to set the valves for different relative degrees of cut-off, according to the average velocities to be made by the locomotive. In the original Vauclain compound this was impossible. In French locomotives the engineers, although they have two sets of distributions in their hands, do not vary the relative cut-offs, once they have found the best relative points of cut-off for the four valves. Other four-cylinder locomotives require either four valve gears or else rocking-shafts; but in the "Adriatics" all this extra mechanism is avoided, and the dissymmetrical arrangement of the cylinders has not, in practice, been found to entail any inconvenience, the motion of the engine being, on the contrary, much steadier at high speeds, and in passing through curves, than any other locomotive known to the writer, including American types, which are in general such rough-riders as to bear no more comparison with the "Adriatics" than with the motion of a Pullman car. The explanation is that the "Adriatic" footplate is suspended over the long swing links of the front truck, where the shocks are completely dissipated before reaching the main frames.

LOOPING THE DOUBLE LOOP.

In the field of loop-looping which has become so immensely popular of late, professional as well as amateur wheelmen have developed an amount of zeal which is without doubt worthy of a better cause.

All of the most recent achievements, such as, for example, the ride through a loop of which a portion of the upper part has been removed, or looping a complete loop and then over a gap in the second ascent, or looping the gap without the attendant loop, are fundamentally questionable acrobatic feats, that always present more or less danger to the life of the performer.

As has already been remarked, the spectators lose interest in them more and more, and as a novelty of the season they will soon disappear from the programmes, particularly since they are too often attended with trifling and even serious accidents.

The latest novelty in this line is the invention of an ingenious wheelman of Berlin, Böttner by name, who has constructed a double loop, and happily performed the feat of passing through it on his wheel. It is most certainly the pinnacle of mad daring, and will at all events not very soon witness a rival in popular favor.

In this new loop, as we show in the cut, the performer, after he has passed through half of the large loop and with his head still down, must guide the wheel into the smaller loop and out of it again, his head being again turned toward the earth, upon the finishing arc of the larger loop. Just imagine with what velocity the performer is hurled through these two loops, and perhaps it may be possible to appreciate the stoical quietude of his nerves, his rare skill in managing his wheel, and above all the presence of mind necessary to a successful exit from the whirl.

Since the greatest possible speed is necessary to overcome the resistance offered by the two loops, the starting point is placed somewhat higher than ordinarily, and the first descent quite a little steeper; the retarding stretch is also built steeper than heretofore.

The whole performance is a ride of death in the true sense of the expression.

If this new sensation be exhibited in the Schumann circus, according to present plans, the intrepid wheelman will surely not finish without the most vociferous applause on the part of the breathlessly expectant public.

For the present Böttner has erected his double loop in an open lot in the southeastern section of Berlin, where he practises daily.—Illustrirte Zeitung.

A PHOTO-RELIEF MADE BY THE AUTOPLASTIC PROCESS.

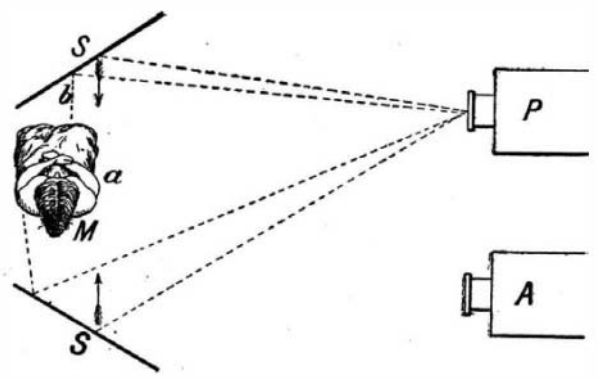


DIAGRAM SHOWING THE UNDERLYING PRINCIPLE OF THE AUTOPLASTIC PROCESS.

LOOPING THE DOUBLE LOOP.

THE AUTOPLASTIC PHOTOGRAPHIC PROCESS OF PRODUCING SCULPTURAL PORTRAITS.

BY DR. ALFRED GRADENWITZ.

Many attempts have been made to reproduce plastically the external shape of a model. The photographic camera has been used in this connection as far back as in 1861 by the Parisian sculptor Willème, by taking as many views as possible of the same object from different positions. These different views were then used in calculating the various dimensions of the model, and were translated to the molding block with the aid of a pantograph. The "photo-sculptures" produced in this way attracted, it is true, not a little attention. But the skill of the artist played a more important part in the process than the actual mechanical methods employed. In fact, in all of these methods, light alone by no means produces the plastic effect.

An interesting novel process was recently presented to the Berlin public, when Signor Carlo Baese, of Florence, delivered a lecture at the Urania. The new process necessitates only the taking of ordinary views of the object, whereupon, by means of photography, without any retouching or any correcting on the part of the artist, a relief corresponding perfectly to nature is obtained by employing the swelling property of chromium gelatine.

It has been known for some time that chromium gelatine will lose more or less its power of swelling according to the intensity of the light to which it is exposed, so that a layer of that substance, on being printed beneath a negative, will reproduce the different shades of the negative in relief. Heights of the relief upward of 1 centimeter (0.3936 inches) may thus be obtained readily, while the clearness of details is such that an artist would have the greatest difficulty in securing similar results. Attempts hitherto made to utilize this property, in connection with the production of plastic pictures, failed to give any positive results, as the principal condition, namely, the existence of a negative of a transparency proportional to the relief of the model, was not fulfilled. Mr. Carlo Baese has shown how success may be attained.

With ordinary negatives, the darkening of the plate, as need hardly be mentioned, depends on a multitude of factors other than the plasticity of the model. In the first place, the colors of the model play an important part, while the actual distribution of light is not without its influence.

In the Baese process the model is illuminated by means of a projection lamp, the light rays striking it at right angles to the direction in which the photograph is to be taken. This is insured by the arrangement represented in the diagram. *P* is the projection lamp, throwing the light on the mirrors, *SS*, the rays being reflected to the model *M*. *A* is the camera. By means of a light filter, inserted in the projection apparatus, the light is graded so that the illumination decreases in intensity gradually from the left to the right, the model being illuminated so as to have the foremost parts struck by the brightest and the back parts by the darkest portions (point *a* bright, point *b* dark).

This gradation of light, which is noted on the model rather distinctly in the direction of the arrows, is so modified by the different inclination of the surfaces on which it is distributed, as to be hardly recognizable from the photographic camera. A view obtained with a similar illumination will therefore by no means reproduce the most salient portions as the most opaque; this would, by the way, not be obtained if the model were uniformly illuminated with white light. The coloring of the model, as a matter of course, would also have its influence on the plate, so as to give values quite independent of the height of the points in question.

Now, if after the exposure of this first plate, the gradation filter in the projection lamp be inverted so as to have the most transparent portion replaced by the darkest, and *vice versa*, the luminous intensity on the model will augment from the front toward the back. After a second exposure is made with this new illumination, no further views will be necessary. The transposition of the plate and the light filters is effected automatically,