

The Muehl differential

The article in a recent issue of THE COMMERCIAL MOTOR deals very fully and clearly with the disadvantages of the differential, as ordinarily constructed, when dealing with heavy loads on uneven ground. It shows a number of mechanical devices whereby the driver, when in a tight place with one wheel refusing to bite in loose ground and spinning consequentially, can lock his differential and so be able to pull out of the difficulty. The annexed illustration, however, shows a new construction of differential which has been recently patented in America, in which this spinning of a driving wheel in soft places does not occur. Under such circumstances, a locking of the differential takes place practically automatically, without the need of separate action on the part of the driver. It naturally follows that, as this action is automatic, it is instantaneous and comes into play the moment the disturbing road conditions present themselves, so that a car does not "dig itself in" and find itself in difficulties from this cause, but is able to make the best of the drier road surface under the other wheel.

- In the ordinary crown-wheel differential we have two or more pinions mounted in a rotating ring driven by the engine, in engagement with two crown wheels, each of which is in direct engagement with the shaft of a driving wheel, and a balancing action takes place between the two, according to the resistance offered to the wheel, whilst the trouble occurs by reason of the fact that the power is diverted by the action of the gear to the wheel which meets with the least resistance, the other wheel acting as a fulcrum. Instead of being driven when uneven resistance is encountered, it remains stationary, whilst the other wheel is rotated at a high speed over the surface of the ground upon which it is unable to obtain adhesion or to get a grip.

In the Muehl differential we have also two or more pinions mounted in the differential housing which is rotated by the engine, and we also have two crown wheels, one attached to either driving wheel. But, in addition, we have worm gears interposed between the pinions and the crown wheels, the teeth on which are shaped to correspond. These worms are mounted in the differential casing with their axes at right angles to those of the pinions. It will be seen, then, that the rotation of the differential housing in the usual way by the tailshaft causes both pinions and worm wheels to be carried round bodily in rigid relation to each other; whilst at the same time both pinions and worms have a power of rotation upon their own axes, so that they can move rotationally, but not bodily, in relation to each other.

When road resistance is sufficient to give adhesion to each driving wheel, both wheels are equally driven, the crown wheels to which they are attached being carried bodily round by the worms in which they are in engagement, just as, with an ordinary differential, they are carried round by the pinions. But when road resistance upon one wheel is reduced to a point at which it loses adhesion, and would, with the ordinary differential, start spinning, nothing of this kind happens, because the angle of the worms is such that, whilst the crown wheels can drive the worms, the worms cannot drive the crown wheels, and, as a consequence, the differential is locked so far as any movement of the wheel in relation to the differential is concerned. The axle becomes for all practical purposes a solid one, and all the drive is taken in by

the wheel, which is for the moment supported on firm ground and can take advantage of its grip. When both wheels are on firm ground and the car travelling freely, the differential is enabled to act in the usual manner when turning corners, by reason of the fact, already alluded to, that the crown wheels can drive the worms. Each driving wheel is attached to its respective crown wheel, and when a curve in the

road is followed, the outer wheel is forced by its contact with the road to travel a greater distance than the inner one. The outer wheel, therefore, revolving faster than the axle, turns the worm in connection with it and so enables the central pinions to

act and react on the worms with a differential action and to distribute the power to each wheel in the usual manner. It will be seen that the action is the same in either direction ; so that the gear behaves equally well whether the car is going forward, reversing, or is driving the engine. It is claimed that this new device not only meets the wheel-spinning difficulty entirely, but at the same time prevents skidding, or sideslip on greasy roads It may be mentioned that it is already in use on a number of American lorries, including the Jeffery four-wheel-drive model, described in this issue, which car was, I believe, the first the invention was applied to. It may be interesting to note that, after some eight months use of it, Mr. L. H. Bill, of the Jeffery Co., says that it has never failed to work satisfactorily, that with it anti-skid devices are unnecessary, and that it will take the car over roads that it would be impossible to pass along with an ordinary differential. It would appear that a step in advance has at last been made in the construction of this longneglected part of the car. Although it must inevitably be more expensive to manufacture than the ordinary gear, the adoption of the Muehl type may in some cases prove advisable.

Read more at <http://archive.commercialmotor.com/article/13th-may-1915/6/the-muehl-differential#KSdjAgOEvsxOodK6.99>

The Muehl Differential.

An Automatic Differential Lock. A Device which has been Successfully Embodied in the Design of the Jeffery Quad, an American Four-wheel-drive Truck which is Described on the Two Preceding Pages.

By Henry Sturmev.

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An imaginary illustration of the automatic differential-locking gear on the Muehl system.

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