with air. After the tire is filled to the proper degree of hardness, the material is allowed to set, in which process it must undergo a chemical change, so that it cannot again be melted by heat. At the present time the greatest difficulty with a tire filling is that the wheels, tires, and tubes must be sent to the factory for filling. A properly filled tire rides about as easily as an air-filled tire at the same pressure, while the advantages in favor of the filled tire are many. Punctures obviously cannot have any effect upon it.

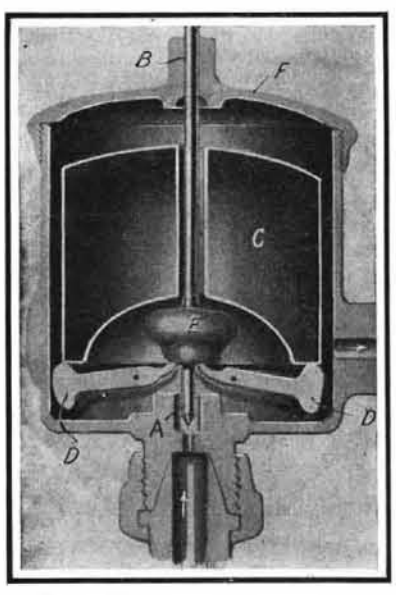
Spring wheels nearly always have an ordinary felloe and rim equipped with a solid rubber tire. Within the wheel arrangements of springs are designed to take up the shock and vibration (Figs. 20 and 21). The most common defect of spring wheels is that while they may be resilient, they do not hold the rim and tire strictly at right angles to the axle. Then again, any mechanism depending upon springs for its action is only as reliable as the spring.

Attempts have been made to introduce special wheels (usually shod with a solid tire) which depend for their resiliency upon a pneumatic tube or tire about the hub or within the felloe of the wheel. Combinations of this kind are expensive, and none of them have become very well known commercially.

The tire problem is the most serious one which the manufacturer and the automobilist have to face to-day. There is no question but hundreds of people would become users of the automobile if they were not afraid of the great expense and uncertainty of pneumatic tires.

CORRECTING A LEAKY CARBURETER FLOAT VALVE.

A carbureter float valve may leak for various reasons. There may be dirt in it, in which case a good flushing out with gasoline will stop the trouble. The connection between the float and the valve may be of such a character that the vertical movement of the float causes the valve to rock slightly on its seat. Such a valve is practically impossible to keep tight. The connection between the float and the valve may be bent or badly adjusted, so that the float is unable to close the valve. As shown, the float *A* has a



CORRECTING A LEAKY CARBURETER FLOAT VALVE.

long weighted stem *B*, and shuts off by its own weight the gasoline entering from below. This valve is held open by the float *C*, which rests on two small levers *D D*, the inner ends of which lift upward against the weight *E* of the float valve. The float is supposed to rise sufficiently to let the valve close when the gasoline level is just below the top of the spray nozzle (not shown in the figure). Something may happen, however, to disturb this relation. For example, the weight *E*, which is usually threaded on the stem *B*, may become loose, so that while the weight is held up by the levers, the stem gradually screws itself down through *E* and closes the valve. On the other hand, the top of the float may, in some manner, strike the cover *F* of the float chamber, or the small ends of the levers *D D* may strike the bottom of the float chamber before the valve is closed.

Sometimes the valve simply leaks, and has to be ground in with pumice stone. This is a somewhat delicate process, and requires keeping the stem *B* as near the center as possible while the grinding is being done. By unscrewing the cover *F*, one can generally tell where the trouble lies. For example, if pressing down the stem *B* stops the dripping, it is evident that the trouble is in the float or its connections.

A metal carbureter float such as shown in the cut may have a minute leak, through which gasoline gradually enters and weights the float, so that it does not rise sufficiently to close the needle valve *A* at the proper gasoline level. Shaking the float will disclose the trouble. The remedy is to warm the float in a moderate oven until all the gasoline has evaporated out. While the drying out is in process, dip the float in warm water; the escape of bubbles will show where the leak is. After the float is dried out, allow it to cool and carefully solder the leak.

GETTING HOME WITH A BROKEN UNIVERSAL JOINT.

All cars in which the rear axle is driven through bevel gears have a propeller shaft transmitting power from the engine or transmission gears to the bevel pinions and gear. This propeller shaft has a universal joint at one or both ends, and sometimes the pin or bolt through this joint breaks. The obvious expedient is to hunt up a temporary bolt of any sort which will go through, and usually this is the best that can be done. Sometimes, however, not even an ordinary iron bolt is to be found, and in that case one may get along by making up a bundle of fairly thick iron wire, such as telegraph wire. This bundle, as large as will collectively enter the hole, is bound securely at its ends, and the ends of the wires are then splayed out and turned over. Evidently cautious driving is required with such a makeshift, but it has been done successfully.

SUPPRESSING RATTLE IN BRAKES, MUD GUARDS, ETC.

Most noises due to loose brake shoes and miscellaneous control members about the car are easily traced, and their correction demands only a little time and common sense. Sometimes leather may be used to quiet a part that rattles. Sometimes a tension spring will do the work. Sometimes bearing pins wear loose in their holes, and the latter must be reamed and larger pins inserted. Sometimes the mud guards work loose. A somewhat troublesome problem is presented by an aluminium mud guard which has cracked from vibration. It must be braced and held by small bolts with large heads, rather than by too large bolts with small heads, as it is dangerous to put much strain on material so soft and brittle as aluminium. It is an excellent plan to use leather washers next to aluminium mud guards, dash boards, etc., wherever bolts go through.

A NOVEL GASOLINE STRAINER.

Most carbureter troubles are caused by dirt or water, which has found its way into the carbureter. When trouble of this kind occurs, the motor usually stops. The crank is turned a few times, and then the carbureter is taken apart, with the result that in reassembling, the parts fail to readjust themselves properly.

In order to overcome this difficulty the Austro-American Separator Company of Cleveland, Ohio, have introduced a funnel which separates all water and dirt from gasoline. The separating is accomplished by the use of two pockets, in which water and dirt accumulate on account of their greater specific gravity, and by the use of two very fine, specially woven water-separating gauzes. Gasoline runs through this funnel much faster

than it will percolate through chamois skin. Furthermore, chamois skin does not efficiently separate water from gasoline, automobile superstition to the contrary notwithstanding. Water settles, being heavier than gasoline. Hence the pressure of the inpouring gasoline forces the water through the skin, with the possible exception of a few drops left on the surface. Again, only one out of a hundred new chamois skins is thick enough and uniform enough to remove some water from gasoline; on the other hand, gasoline runs through this kind of a skin very slowly.

The new automatic separator mentioned prevents water from entering the carbureter, even if the gasoline tank is full of water and dirt. When a certain amount of water has accumulated in the separator the gasoline line is automatically shut off, until the water is drained by opening a pet-cock at the bottom of the separator. Water being heavier than gasoline, will naturally settle to the bottom. Therefore, when the pet-cock, which is the lowest point in the gasoline tank, is opened, all the water will run out of the tank through the separator, taking the dirt with it. As soon as the water has escaped, the gasoline line is automatically opened. The motor will start on the first turn of the crank. The gasoline flows downward into the separating chamber and thence upward through an extremely fine mesh wire gauze to the outlet. Clogging of this gauze is impossible because the gasoline flows against gravity.

A NOVEL SPEED-CHANGING GEAR.

(*Concluded from page 58.*)

are two lugs which move in the spiral annular grooves in the member *c*. A twist of the conical sleeve *S* by means of the levers *a* will cause them to travel parallel with the shaft and will permit the pawls to engage in the ratchet wheels or will prevent the pawls from thus engaging. The shaft transmits the power through a rigid pin to the ratchet wheel, by which it is in turn transmitted to the four pawls. From the pawls the power is transmitted through the lugs located on the hub of each pawl, or through the disk to which the pawls are attached, to the gear. When the gear is the driver and the shaft is the follower, the power is transmitted in the reverse order.

The clutch *E* is operated when it is desired to drive the countershaft through the gear *A*, but when it is desired to drive the rear axle shaft directly from the engine shaft without going through the countershaft, the clutch *F* can be operated. The lower view illustrates this. The line *x*, the dividing line of the shafts, lies inside of the disk *b*, so that the shaft can never get out of line. The hub of the disk *b* is keyed to the driving shaft by the pin *f*, so that *b* always turns with the driving shaft. The ratchet wheel *d* is keyed to the driven shaft at *e*. The disk *b* forms a part of a casing which holds the pawls *p*. When these pawls are in mesh with the ratchet wheel *d*, the rear axle shaft will be directly and rigidly connected with the engine shaft.

When the engine shaft and rear axle shaft are direct connected, the countershaft and none of the gears are running; all the clutches except *F* are out; and the wheels *A*, *B*, *C*, and *D* are loose upon their shafts. Any number of gears can be used and therefore any number of speeds obtained.

The device furnishes a positive drive with no chance of slippage, without lost motion and with inappreciable wear because the gears run in oil. There is no possibility of stripping because the gears are always in mesh. The pawls in the opinion of Prof. Williston are "superior in strength and reliability to gear teeth as a means of transmitting power," and transmit the load "more nearly in direct compression than is the case with gear teeth." The conical sleeve is about as simple a disengaging and engaging mechanism as can be imagined. The clutch, moreover, can be operated in all positions, which is not the case with sliding gear devices. Any clutch can be operated regardless of the position of the other clutches, so that it is unnecessary to pass progressively from low speed through the intermediate to high speed.

One hand lever only is required to operate all gears. The dotted lines in Fig. 1 indicate shafts leading to hand and foot levers. The hand lever operates clutches *E* and *F* in Fig. 1, which it will be noticed face each other, thereby causing pawl *K* of clutch *E* to be thrown in at the same time pawl on clutch *F* is cut out. In this position the spiral grooves run in the same direction. It is possible to connect the small cranks of clutches *E* and *F* to the same hand lever, and operate both clutches with one movement of hand lever, thus throwing the power from the direct drive to the countershaft or from the countershaft to the direct drive as desired. The low and intermediate gears are operated by foot levers. The low gear has an automatic reversible clutch. If power is stronger to go forward, the forward pawl will engage, and if the power is stronger backward, the backward pawl will engage. For example: If a car is coasting down hill and the engine is working on the low gear forward, the speed of the car is greater against the low gear and acts as a brake.

RECENTLY PATENTED INVENTIONS.

Pertaining to Apparel.

HEAD-COVERING.—W. BERNSTEIN, New York, N. Y. The object of this invention is to provide a head covering for infants and children, arranged to properly fit the head and to allow convenient washing and cleaning of the covering with a view to insure long service and to maintain the covering in a neat and tidy condition.

Electrical Devices.

COMBINED FUSE-PLUG AND CIRCUIT-CLOSER.—F. F. VINDEMORE, Fairview, N. J. Means provide in this case for closing one electric circuit of high potential, by the operation of an electromagnet energized upon the closing of a second circuit preferably of low potential, and more particularly to certain improvements, whereby the circuit closer is combined with the fuse plug, and the two supported upon a single base.

Of Interest to Farmers.

BEET-TOPPING MACHINE.—J. N. HANNA and D. K. WAUGH, Ordway, Colo. Swiveled colters are placed at opposite ends of the apparatus and in advance of the guard wheels on the tapping mechanism to cut off tops and trash and assist in guiding the wheeled truck; shovels are arranged having landsides to throw the tops, etc., cut by the colters to the outside of the topping mechanism. Means provide for taking the weight from the wheels as the guard passes over a high beet top and thus prevent the wheels from striking the beet, which avoids breaking the high tops. A mold-board cutter forward of the colters removes to one side all rank tops standing upright.

DEVICE FOR SUPPORTING AND ADJUSTING THE CONCAVE OF A GRAIN-THRESHER.—P. HASTER, El Paso, Wis. The thresher affords inexpensive and convenient means for reliably supporting the toothed concave of the machine in a substantial upright position, in front of the toothed cylinder thereof, and enables the speedy outward rocking adjustment of the concave while the machine is running at full speed, thereby facilitating the tightening of loose teeth thereon or replacing a broken one, as occasion may require.

Of General Interest.

EXTENSIBLE PICTURE-FRAME.—C. VAN DER BOOM, Platte, S. D. The object here is to produce a frame which can be adjusted so as to hold pictures of various dimensions within certain limits. Further, to enable the frame to be hung with its longitudinal axis in a vertical or a horizontal position, and to provide means for removably attaching a supporting leg to the back of the frame in such a way that the frame may rest upon a support with its longitudinal axis in a vertical or horizontal position.

BOTTLE.—F. SONNENFELD and R. FISHER, New York, N. Y. The bottle has a valve-controlled discharge nozzle carried by the neck and communicating within the neck with a tube extending substantially to the bottom of the bottle. In combination with this form a stopper having a valve-controlled passage therethrough is employed, the means for operating the valve being below the top of the stopper, so that it cannot be operated acci-

(*Continued on page 69.*)