Progress in 1912 Axle Construction

Practically All Makers Add Floating Types to Their Lines—Driving Shaft Ends Are Secured to Wheels—Pleasure Car Axles Are Used as Jackshafts—Bevel Gear Differentials Most Generally Used

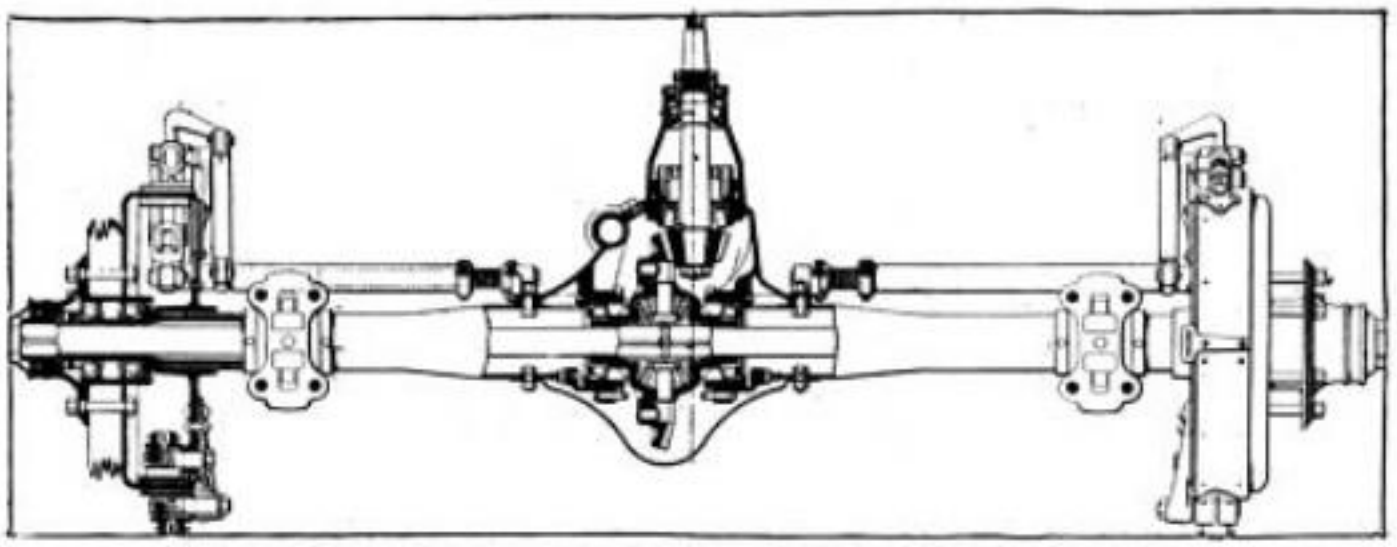

FIG. 1—SHOWING DETAILS OF NEW TIMKEN FLOATING AXLE

AS for the progress in axle construction for the season of 1912, the popularity of the floating type of rear axle has led practically all makers to add this axle to their lines; while, on the other hand, all makers of floating type axles have in one sense reverted toward the semi-floating type by adopting one of its most desirable features. This feature is the rigid attachment of the rear wheels to the driving shafts. Most manufacturers have done this by either forging or otherwise securing a flange to the end of the axle driving shaft which is bolted to the hub or outer flange of the hub; in most cases an extension being made to the hub flange bolts for the attachment of the driving shaft flange. This construction has lead one or two makers to call their axle a three-quarter floating type, but whether or not this term will hold remains to be seen. Pleasure car rear axle manufacturers have found that the ordinary rear axle construction is very suitable as a jackshaft for chain driven vehicles, and have converted their mechanisms for such uses by simply attaching sprockets to the ends of the driving shafts and providing facilities for the attachment of the radius rods. There is a marked tendency toward the unit assembly of gearsets with jackshafts and rear axle. Two makers are bringing out an internal gear drive axle as standard equipment. And practically all differential mechanisms are of the bevel gear design.

Timken—In addition to its regular line of front and rear axles for pleasure and commercial cars, the Timken-Detroit Axle Co. is now making three new truck outfits, comprising combination rear axles and jackshafts for chain-driven vehicles. There are no radical changes in the standard types of axles made by this company, but several notable improvements are to be found. In the front axles for pleasure cars, for instance, the yokes at the ends of the cross rods are of tapered design instead of angular, giving additional strength and an improved appearance. The yokes are fitted with hardened and ground steel bushings having an adjustable tapered bearing on the yoke pins; and the yoke pins are secured in the arms with bicycle keys. The bearing surface of the pins has been increased, and dust caps are fitted over the heads, whilst the steering balls are ground true and smooth.

As for the rear axles for pleasure cars, the brakes of the larger axle have been increased from 14 to 17 inches in diameter; while those of the smaller axle have been increased from 12 to 14 inches. The internal brakes now are adjustable without removing the wheels. The drive and pinion shafts are of nickel steel with the dogs on the ends of the driveshafts forged integral. A feature of the larger pleasure car rear axle is that of driving the rear wheels through a steel flange that bolts to the hub flange, instead of through a dog clutch that meshes with notches in the hub; the advantage claimed for this being that longer life should be obtainable while driving through the steel of the hub than through the cast steel. In the hubs of the differential the cups now are adjustable instead of the cones, which permits of the cones being pressed on to the shafts, thereby reducing wear. The torque rod pins are provided with adjustments to prevent them from rattling. And driving gears and pinions are ground in, to promote smooth and silent operation. All moving parts are on Timken adjustable roller bearings.

Weston-Mott—The Weston-Mott Co. has made quite a number of radical changes in axle design for the season of 1912. The company now has seven new axle designs in which the gearcase cover opens up directly to the back, allowing the differen-

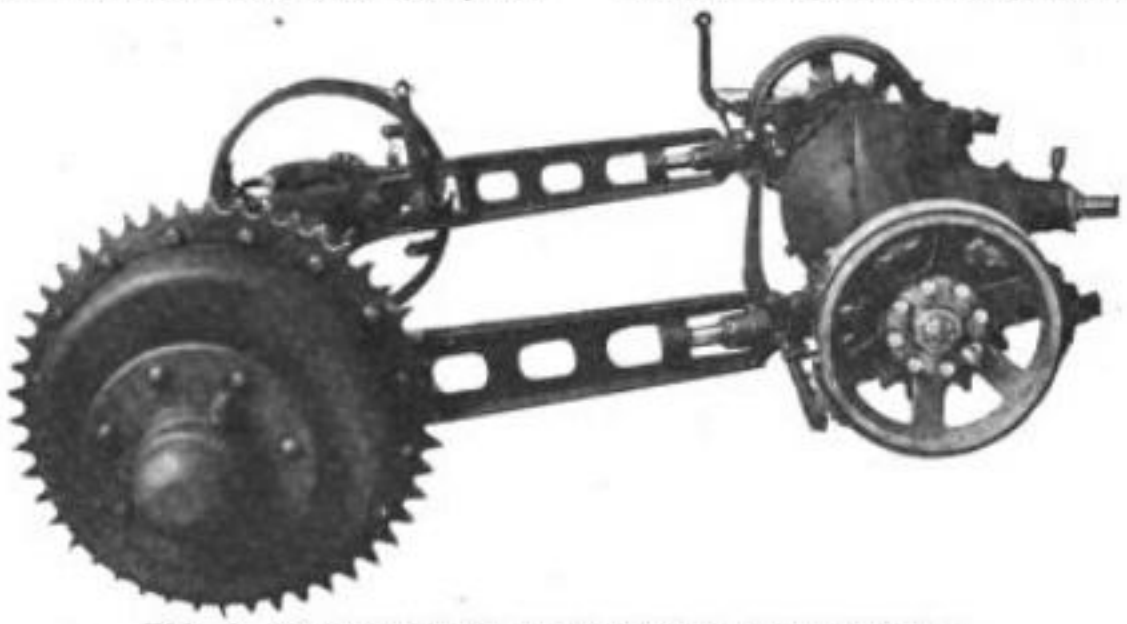

FIG. 2—NEW TIMKEN COMMERCIAL CAR OUTFIT

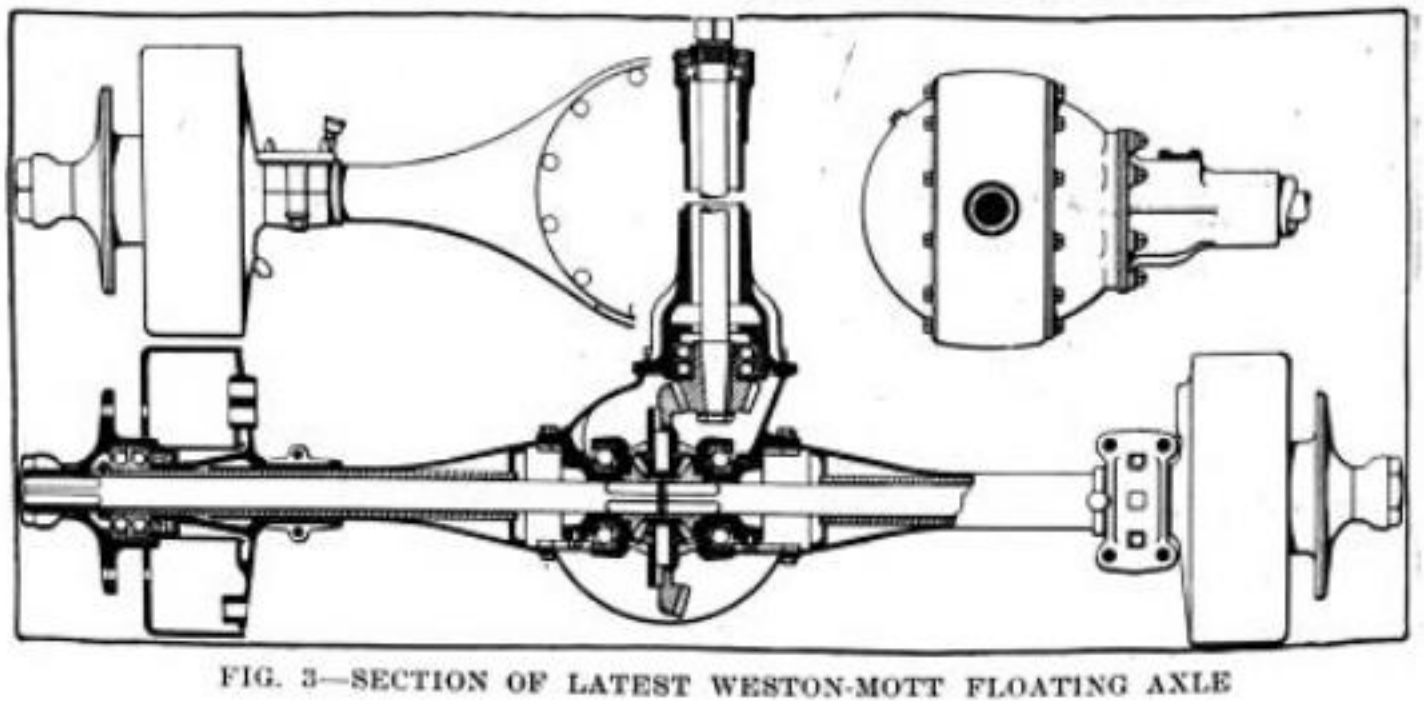

FIG. 3—SECTION OF LATEST WESTON-MOTT FLOATING AXLE

tial to be taken out of the axle. These are all of the single bearing floating type, viz., the hubs being driven by the hub flanges, which are fastened directly to the driveshafts. This makes a very neat design and does away with the large, clumsy looking hub which was used on the double-bearing floating type axle. On the lighter types of these axles high carbon steel shafts are used, or the nickel steel shafts may be fitted, while on the larger axles either nickel steel or chrome vanadium shafts are used. These axles are designed for cars weighing from 2,000 to 5,500 pounds. One of these axles is especially designed for use on electric cars. Besides these new designs, the company has its regular types of vertical split axles, also two types of axles which are split horizontally. Taking in all the designs, the company makes axles for cars weighing from 1,000 to 5,500 pounds. In the way of front axles, the company makes almost any type of axle with I-beam centers, and can also furnish the different styles of tubular axles. Truck axles for cars up to 1½-ton capacity also are features of the line. Most of the Weston-Mott Company's axles can be furnished with either internal or external brakes, or double internal brakes, and practically all types can be made with either semi or floating type hubs. A new type of scissors brake is being used on the double internal design, which has been found very effective and smooth acting. Single and double row annular balls are used throughout this mechanism.

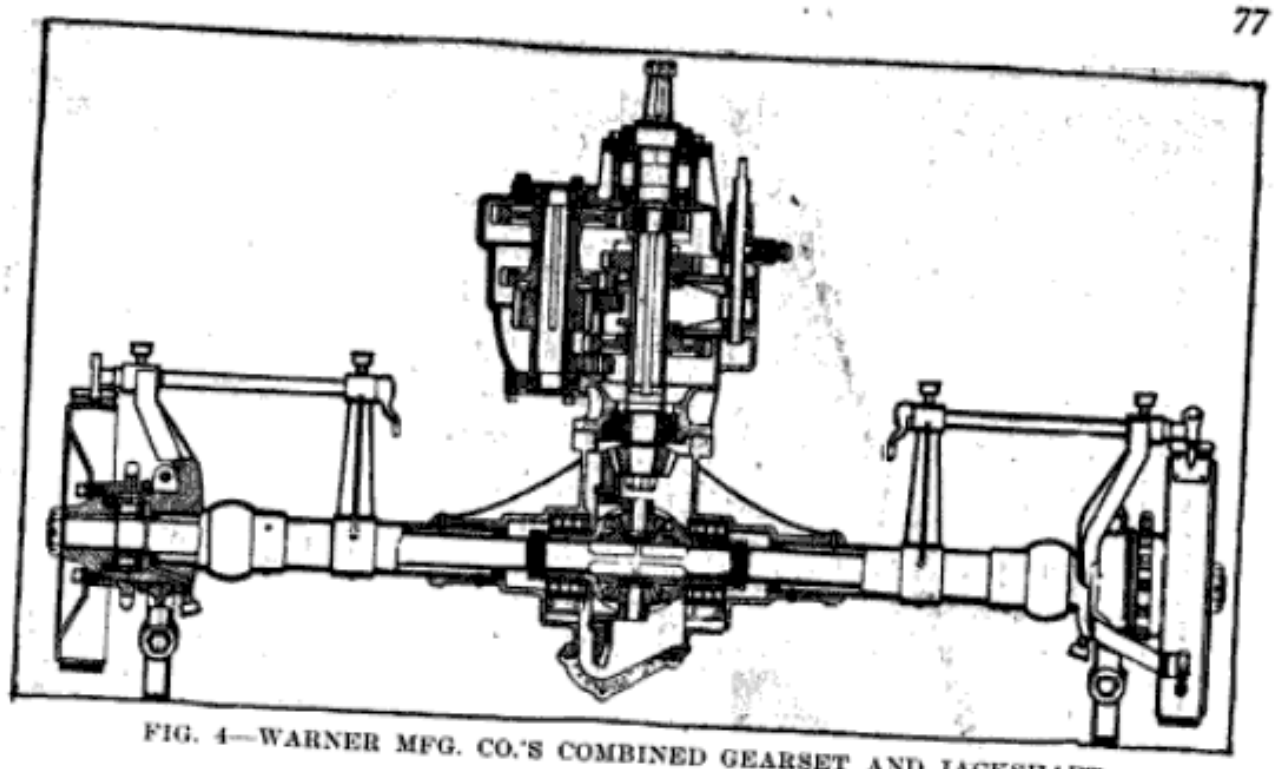

FIG. 4—WARNER MFG. CO.'S COMBINED GEARSET AND JACKSHAFT

Metal Products—The Metal Products Co. of Detroit devotes its plant exclusively to the manufacture of front and rear axles for motor cars.

The Metal Products Co.'s front axles are steel drop forgings. The spring seats are forged integral; drop forged heat treated steering knuckles are employed, which have a long bearing surface on hardened and ground steel pins, and Bower roller bearings are standard equipment in the front wheel hubs.

The rear axles are of a floating type, with the differential unit mounted on single row annular ball bearings, the driving axle ends on double row annular ball bearings, and the pinion shaft on a double row annular ball and a Hyatt roller bearing. The feature of the rear axle construction is the continuous pressed steel housing, whose webbed design makes an unusually strong reinforcement. The housing is made in two halves, which are riveted together and then welded by the oxy-acetylene process. Another feature of this axle is the means of securing the ends of the driving shafts to the wheel hubs. Instead of a dog clutch which slips into notches on the outer edge of the hub, a steel flange is pressed onto the squared ends of the driving shafts, which is secured direct to the hub-flange bolts. The drawing shows that there is a threaded projection on the heads of the hub flange bolts, and the steel flanges on the axle shaft ends are fastened to these with nuts. This eliminates wear and lost motion between the wheels and drive shafts, and relieves the entire transmission mechanism of the strains that occur when lost motion is present. Ball thrust bearings are provided to take the lateral thrust of the differential units and ample provisions also are made for adjusting the gears so that they may line up properly. Both brake levers are brought in toward the center so that the rods are inside of the chassis frame; and there are no internal brake adjustments that require the removal of the wheels when adjustment is necessary.

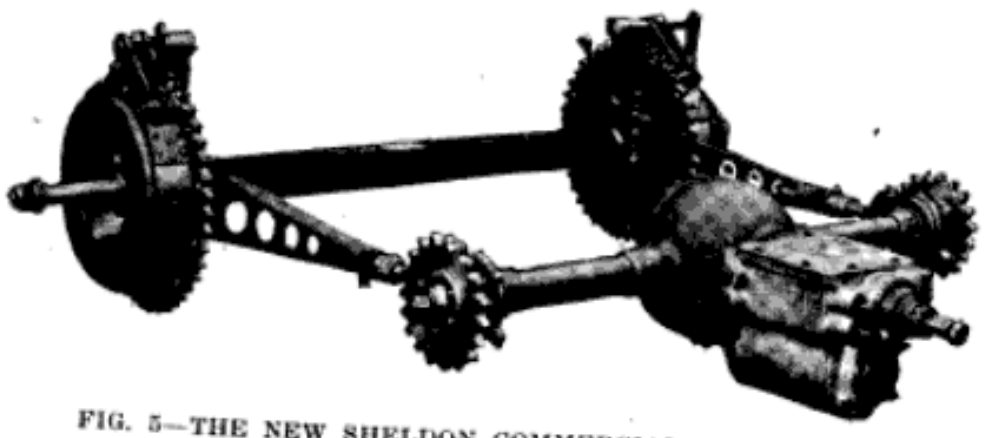

FIG. 5—THE NEW SHELDON COMMERCIAL CAR OUTFIT

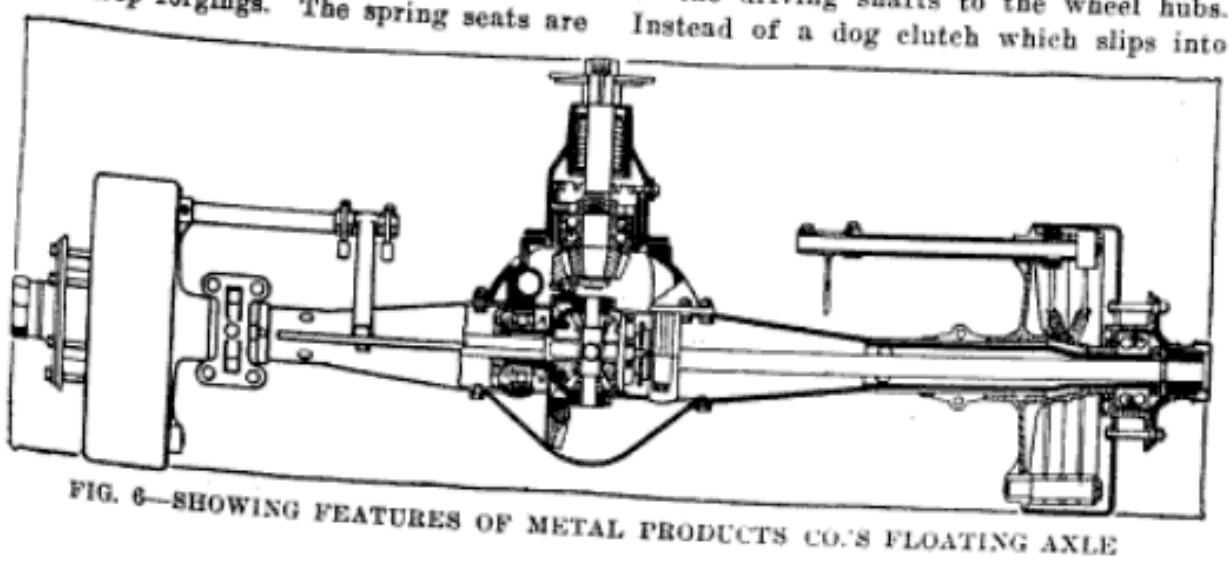

FIG. 6—SHOWING FEATURES OF METAL PRODUCTS CO.'S FLOATING AXLE

American—Floating rear axles and I-beam drop forged front axles are the chief products of the American Ball Bearing Co. for 1912, but an interesting feature of the line is the Lanchester worm-drive axle. In this axle the worm is of a special alloy steel, while the larger gear is made of a special bronze alloy. Ball bearings are used throughout the American axles. In the front axle there is a ball-thrust bearing at the upper end of the steering knuckle pin, while the front wheel spindles are equipped with adjustable cup and cone bearings. In all floating types of American axle design, the differential mechanism with the bearings upon which it is mounted may be readily removed as a unit. Accessibility to the vital parts of the rear axle mechanism is recognized as very essential in American axle construction. Ample provisions have been made for the adjustment of the driven gear relative to the driving pinion, so that noiseless operation may be maintained.

Lefever—A selective type transmission gearset with one rod control, coupled with a jackshaft provided with brake drums, is one of the features of the Lefever

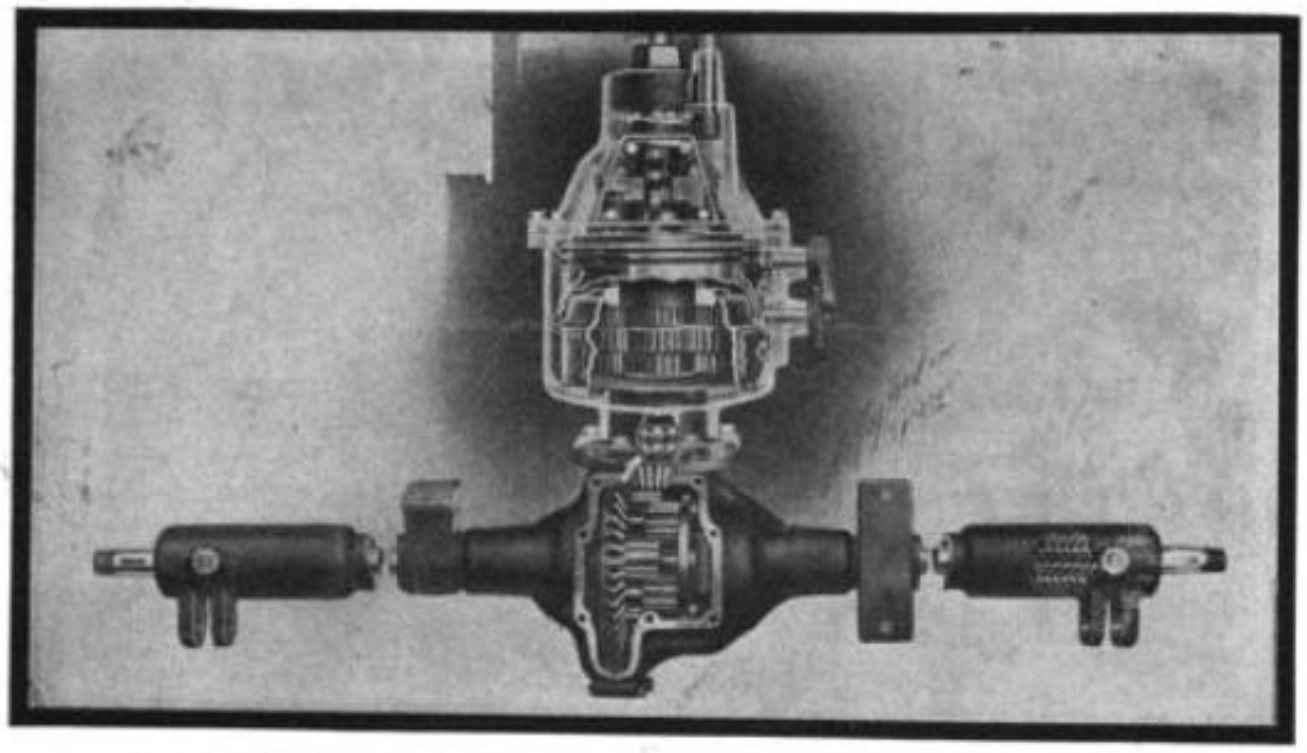

FIG. 7—LEFEVER ARMS CO.'S PLANETARY GEARSET AND JACKSHAFT

Arms Co.'s line. This company also manufactures a planetary transmission gearset and jackshaft for commercial vehicles. Both the selective type and the planetary gearset have the same size face of flange, which permits the assembly of the jackshaft in the frame independently, and then either the selective or planetary gearset coupled thereto. The planetary gearset and jackshaft combination is shown in Fig. 7.

Warner—In addition to its transmission gearsets, steering gears, etc., heavy duty truck and light-delivery jackshafts are features of the Warner Mfg. Co.'s line. These jackshafts have in unit with them the Warner jackshaft transmission gearsets, which are a selective sliding gear type, giving three forward speeds. This combination jackshaft and gearset assembly comprises contracting brakes on the ends of the jackshafts, strut rod connections centered on the shaft and fitted with a joint for side motion, and the sprocket centers are directly over the roller bearings. Bower roller bearings are used on the ends of the jackshaft, the driving and differential gear unit is mounted on Hyatt high duty bearings, while in the gearset the main shaft is mounted on double row annular ball bearings and two sets of single annular ball bearings. Single annular ball bearings are employed for the countershaft.

Driggs-Seabury — The Driggs-Seabury Ordnance Corporation is making several styles of I-beam dropped forged axles with wheel spindles equipped with double row New Departure annular ball bearings, and is featuring two designs of floating rear axles for pleasure cars. One of the latter, Fig. 8, is similar in design to what another concern terms a three-quarter floating type. In this axle are combined, it is claimed, all the advantages of both floating and semi-floating types, with improvements upon each. The center or main body of the axle is formed of a hydraulically-pressed steel housing extending in one unit from hub to hub and so designed that loads are carried on wrought steel making a strong construction.

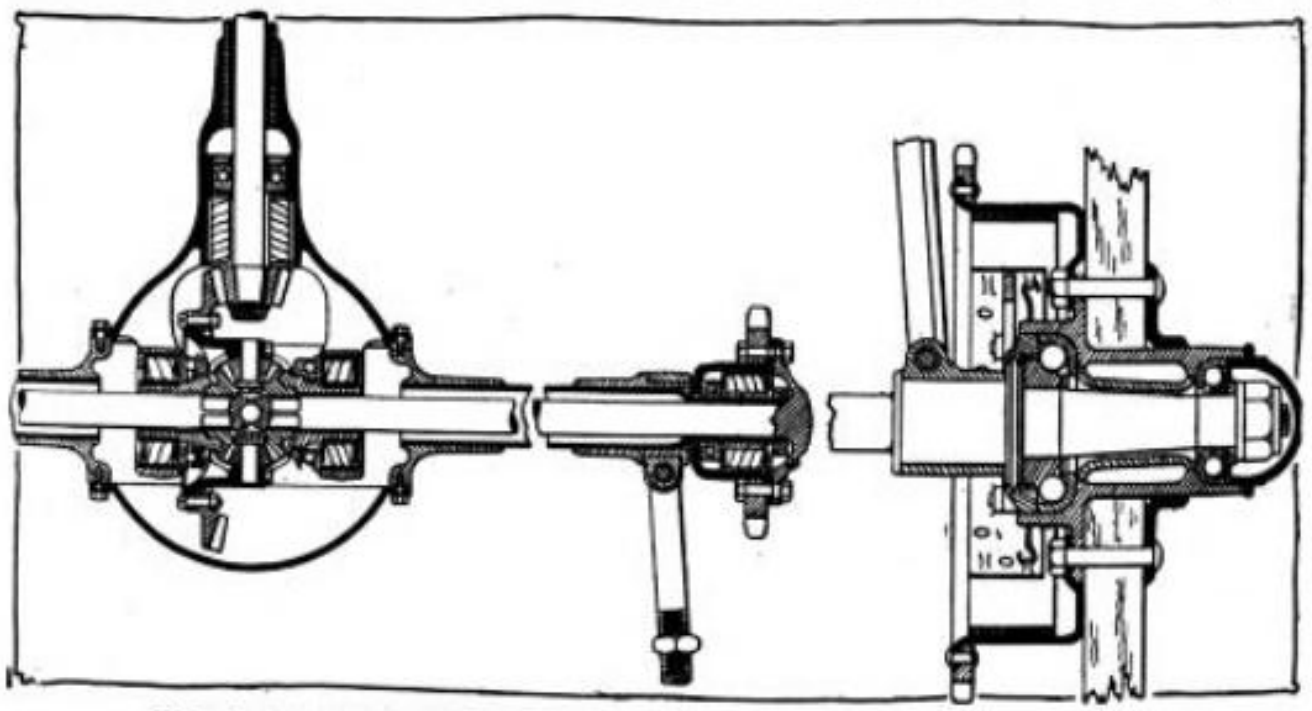

FIG. 8—SECTION OF SHELDON JACKSHAFT AND REAR AXLE END

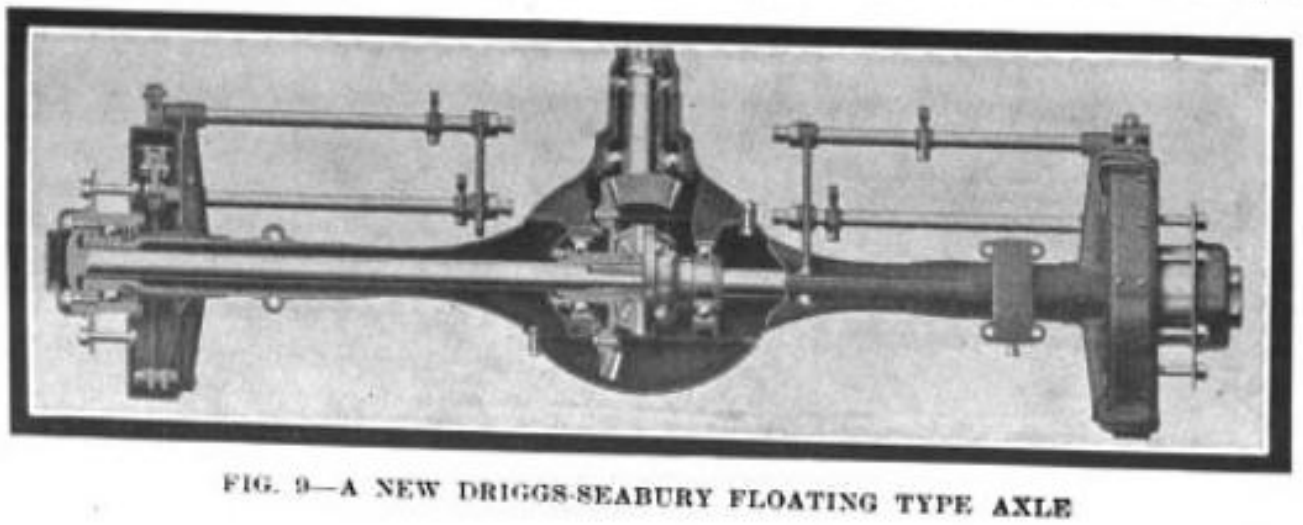

FIG. 9—A NEW DRIGGS-SEABURY FLOATING TYPE AXLE

The differential housing and its accompanying driving mechanism are inserted in the pressed steel axle center through a suitable opening at the front and then securely fastened in place, while at the rear of the axle a similar opening is provided which allows the removal of the differential and driving gear unit with its accompanying bearings, without the necessity of removing the wheels or any other portion of the axle, excepting the driving shafts. This greatly facilitates any necessary inspection or repairs. The wheels are driven through integrally forged flanges on the outer ends of the driving shafts which are bolted securely to the hubs of the wheel. Brake drums are 14 inches in diameter and 2 inches in width, and any type of brake lining may be employed. The brake operating levers are arranged so that all rods may be attached from inside the frame, and these levers can be located along their shafts in practically any desired position demanded by the peculiar exigencies of the chassis design. The propeller shaft is housed in a torsion tube and is connected to the driving pinion by the company's design of splined sleeve construction. Imported annular ball and thrust ball bearings are used throughout in the construction of this axle, which is designed for cars weighing from 2,500 to 3,500 pounds. The company also makes a regular floating type of axle for cars weighing from 2,700 to 3,400 pounds. This axle varies in several points of construction. The jaw clutches on the end of the axle shaft, for instance, are not secured to the hub flanges. Instead of having a single annular ball bearing mounted on the axle casings directly under the spokes, in this construction there are two double row annular ball bearings at either end of the wheel hub. Double row New Departure annular ball bearings are used throughout the entire construction. And there is a slight difference in the arrangement of the brake control rods.

Sheldon—The feature of the Sheldon Axle Co.'s line for 1912 is the combination

rear axle and jackshaft equipment brought out by this company several months ago. This equipment comprises one model having a selective gearset bolted in unit with the driving and differential gear mechanism of the jackshaft, and a complete rear axle with adjustable radius rods communicating between it and the jackshaft. The combination gearset and jackshaft unit, Fig 5, is very similar in design to the rear axle constructions used in pleasure vehicles. The gearset has both its main and countershaft in the same vertical plane, and gives three forward speeds and reverse. The gearset is small and compact and is bolted to the spherical steel housing of the driving gear and differential mechanism. Hyatt roller bearings and ball thrust bearings support the driving and differential gear unit, and adjustable cup and cone

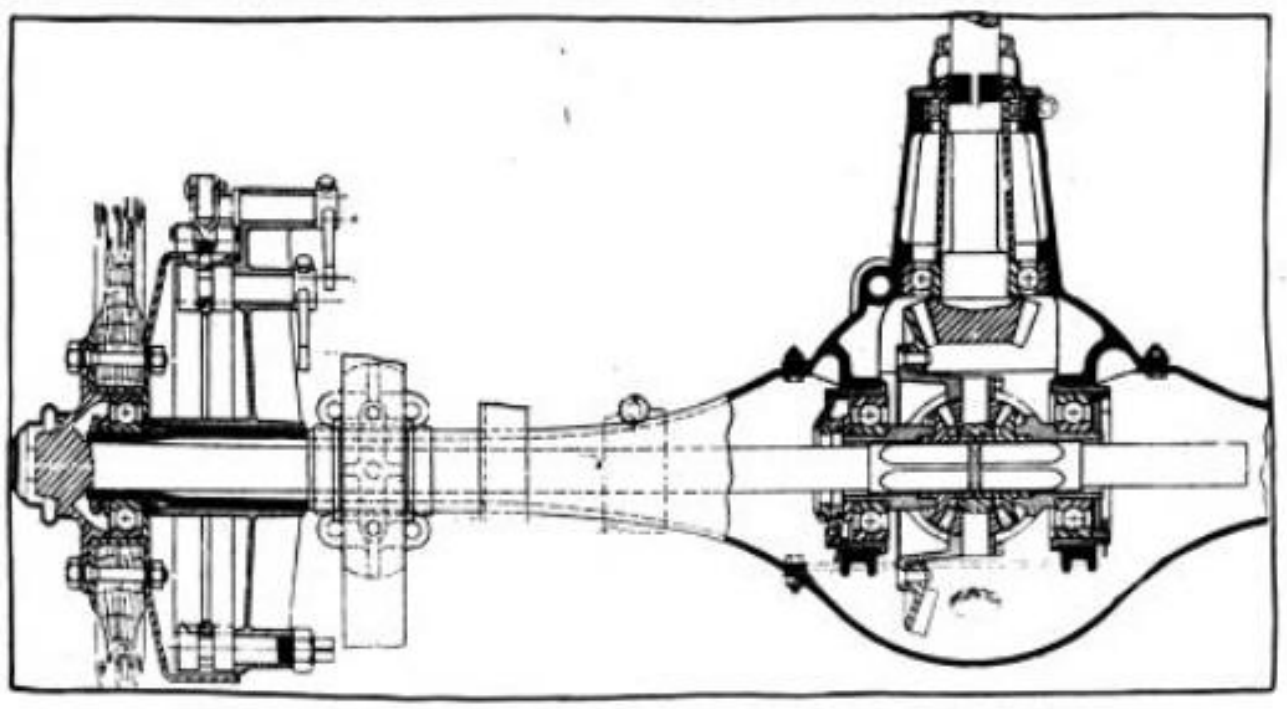

FIG. 10—A SECTION OF THE McCUE CO.'S FLOATING AXLE

bearings are employed at the outer ends of the jackshaft and on the rear axle spindles. This equipment is for trucks of from 1,100 to 2,500 pounds capacity, and is designated TD-13.

There also is another equipment designated TD-52, which does not have a gearset in unit with the jackshaft mechanism. This mechanism is designed for larger vehicles and differs from the one previously described chiefly in that its jackshaft mechanism is a floating design with Hyatt roller bearings used at the outer ends as well as throughout the differential and driving gear housing.

The Sheldon Company also is introducing this year a new floating type of rear axle for pleasure vehicles which is designated 201-D. It is a neat design, with the propellor shaft inclosed in a torsion tube, which is rigidly secured to the housing of the differential and driving gear mechanism. A large cover is provided at the rear of the housing through which the entire differential mechanism may be readily removed. The brakes have a 14-inch diameter and 2-inch face and are of the external contracting type. Hubs are of pressed steel; and the face of the brake drum is the inner hub flange, which makes a light and substantial construction. The outer hub flange is reinforced by a driving flange which is integral with the ends of the driving shaft. A single Hyatt roller bearing is mounted directly under the spokes and a thrust bearing is fitted, or, a German annular bearing may be fitted without the thrust bearing. Hyatt high duty roller bearings and ball thrusts are employed in the differential and driving gear housing.

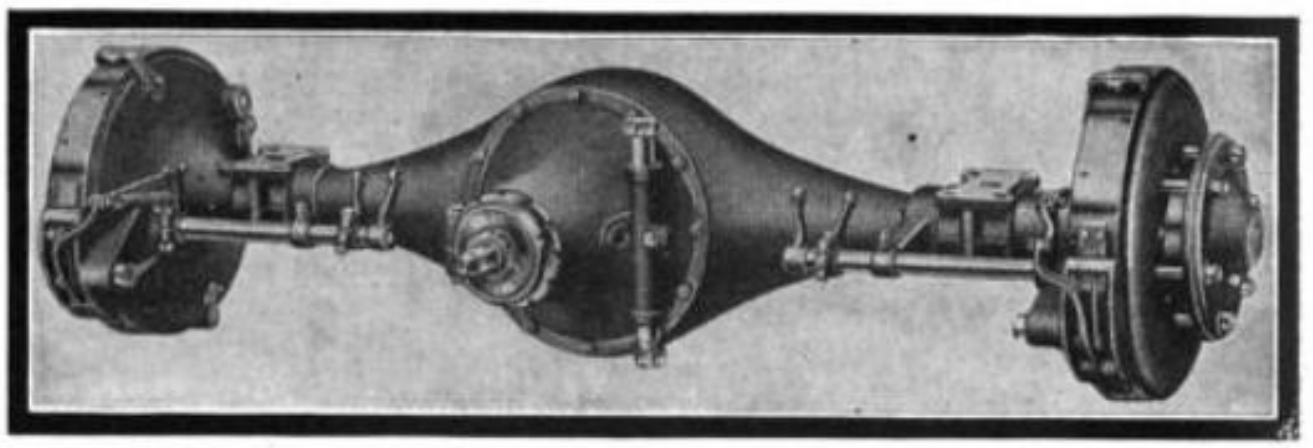

FIG. 11—THE NEW LEWIS FLOATING TYPE AXLE

Lewis—The Lewis Spring and Axle Co. has brought out a new floating type of axle for 1912 which is designated No. 16. In this axle the differential, driving pinion and hub bearings are of the New Departure double row bronze separator type. The differential is of the bevel gear type; and 3½ per cent nickel steel, heat treated, is employed in the shafts and gears. The differential and driving gear mechanism, together with the driving pinion is mounted on a cast steel carrier on which all adjustments are carried so that the entire assembly may be removed if necessary without disturbing any adjustments. The housing is formed of hot rolled steel made in two halves, welded together by the oxy-acetylene process. The tubes which carry the wheel bearings are separate from the main housing and carried back to within 1 inch of the differential, being supported on diamond shaped plates welded to the housing, and also being welded to the main housing in various places, making practically a one-piece construction. Brakes are 14 inches in diameter, of internal and external design; and pure asbestos weave linings, specially treated, are used.

Muncie—In addition to a complete line of front and rear axles, the Muncie Gear Works now is marketing specially designed equipment for commercial trucks, among which are combination planetary or selective sliding gearsets, arranged in unit with the differential and driving gear mechanism of the jackshaft, the radius rods and driving sprockets secured near the ends of the jackshaft. Rear axles also may be added to the equipment to make it com-

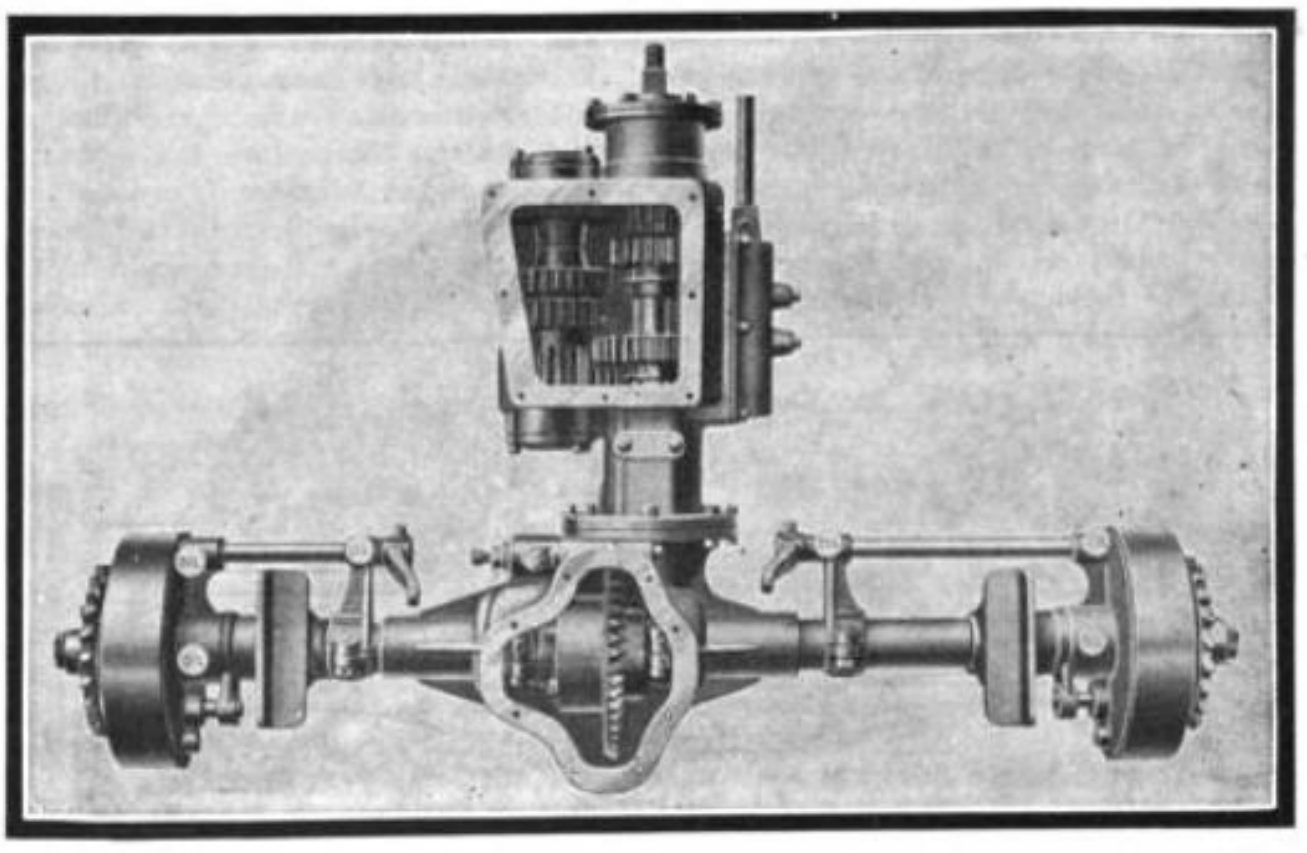

FIG. 12—NEW COMBINED GEARSET AND JACKSHAFT OF MUNCIE GEAR WORKS

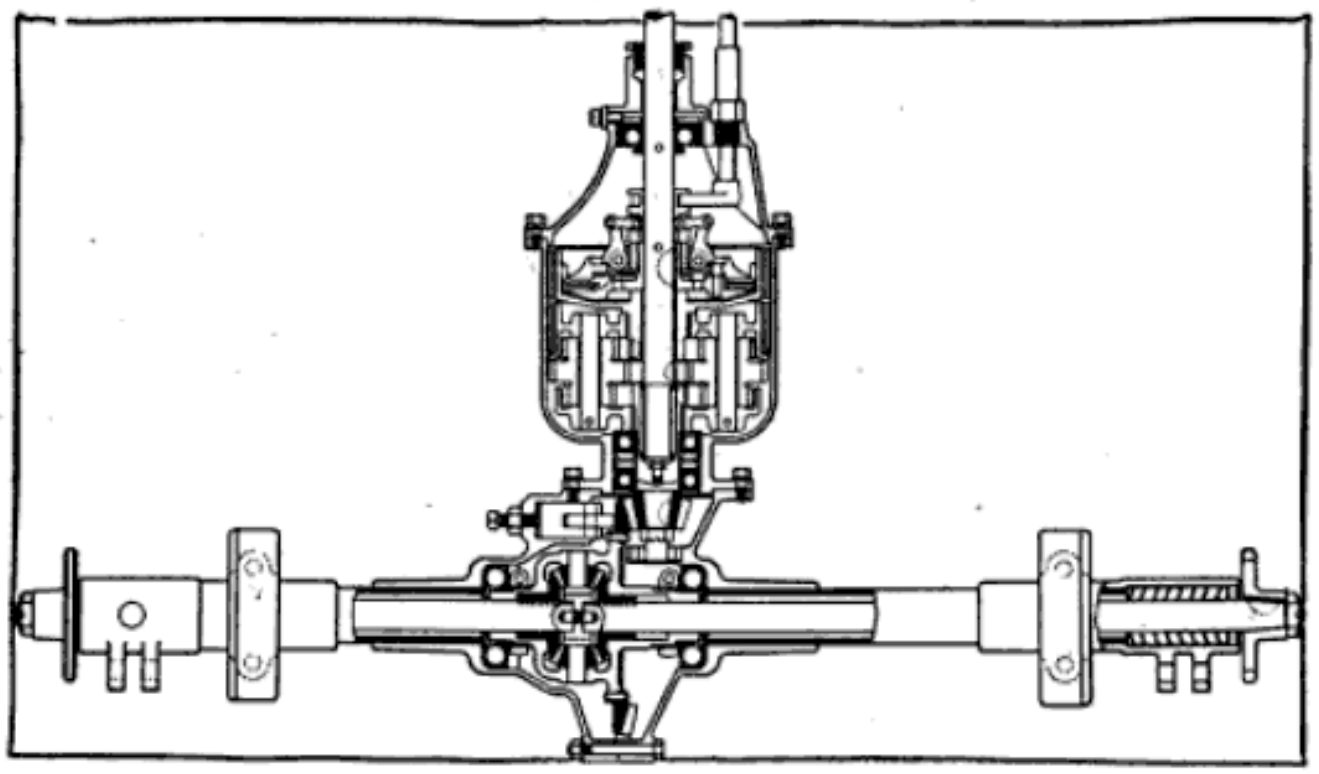

FIG. 13—MUNCIE COMBINED PLANETARY GEARSET AND JACKSHAFT

plete. In this mechanism, Fig. 12, the transmission and driving gear shafts are mounted on New Departure ball bearings, while Hyatt roller bearings are employed at the outer ends of the jackshaft. The hub bearing of both the front and rear axles are mounted on New Departure double row ball type of annular bearings.

The Muncie Gear Works also is marketing this year a selective sliding gear transmission which is made especially for motor trucks and delivery wagons. The use of extra wide-faced gears is a feature of these gearsets.

Another feature of the line for 1912 is the new model G, three-quarter floating rear axle, Fig. 14, for two-passenger cars of not over 1,200 pounds capacity having a motor ranging from 16 to 20 horsepower. This axle is called a three-quarter floating type because it resembles the floating rear axle in that the wheel bearings are mounted externally on the outer ends of the rear axle casing so that the load rests thereon, but at the same time the hubs of the wheels are secured to the ends of the driving shaft as in a semi-floating type of rear axle.

McCue—The feature of the McCue Co.'s line of axles and forgings for 1912 is a complete range of sizes of I-beam front axles and floating types of rear axles. There are practically no radical changes, except that a new internal support is provided for the brake control shaft, a new style of positive brake adjustment is employed, the spring seat construction is improved, and flange hub drive has been adopted in which a flange is fitted to a taper on the ends of the driving shafts and secured by a key and nut.

The McCue front axles are made in various styles, and for cars of various weights. Steering knuckles are plain in some types, while in others the ball-thrust bearing is employed at the upper end of the steering knuckle pin. As for the wheel spindle either annular ball or roller bearings may be fitted.

One of the features of the rear axle line for 1912 is the construction of models XX and 4X, Fig. 10. These axles are designed for high-class cars requiring rigid but light construction. They are of the floating type and the axle housing is made of steel and in one piece, tapering in thickness from 3/16 inch at the center, 5/16 inch at the end. The driving shaft and driving flange are integral and the flange is designed to be secured to the hub of the wheel by six 9/16-inch bolts on a 7-inch bolt circle. The wheel bearings are arranged directly under the center of the spokes so that friction is decreased to the lowest possible point for wheel bearing construction. Annular ball bearings are invariably used in the hubs, but either annular, roller or cup and cone bearings can be used. The model 2X rear axle differs from the model 4X in that in the latter the housing may be opened either from the front or the back to permit inspection, repair or removal of the driving and differential unit. In the model 2X the housing opens only from the front.

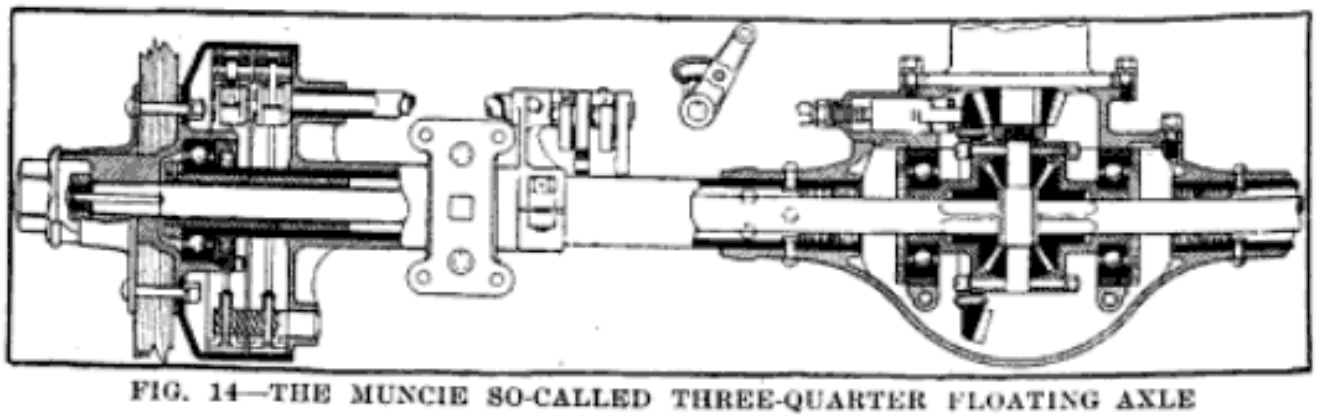

FIG. 14—THE MUNCIE SO-CALLED THREE-QUARTER FLOATING AXLE

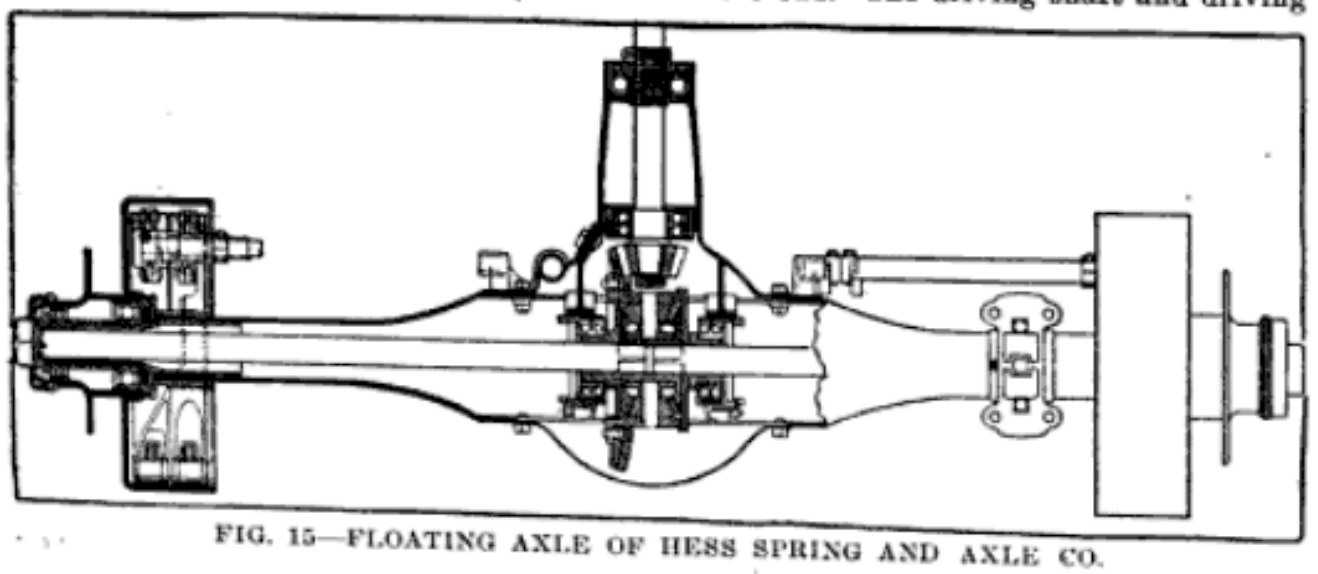

FIG. 15—FLOATING AXLE OF HESS SPRING AND AXLE CO.

Hess—The Hess Spring and Axle Co. is making several styles of I-beam drop forged front axles with either plain, ball or roller bearing spindles; and a floating design of rear axle, designed for use in pleasure vehicles. The rear axle, Fig. 15, is a neat construction in which the center of main body of the housing is formed of pressed steel and extends in one unit practically from hub to hub. The differential and driving gear unit together with its accompanying driving mechanism, are inserted into the pressed steel axle center through a suitable opening at the front and then securely fastened into place, while at the rear of the axle a similar opening is provided which permits of the removal of the differential driving gear unit and its bearings without the necessity of removing the wheels or any other portion of the axle except the driving shaft. This greatly facilitates any necessary inspection or repairs. The wheels are driven through integrally-forged jaw clutches that mesh with jaws in the hubs of the wheels. Adjustable bearings are used and ample means of adjusting them are provided. Brakes are both of the internal expanding type, arranged side by side and operating on the same drum, the control rods telescope, one within the other, and the levers are located near the center so that the brake rods will be inside the chassis.

Salisbury—The Salisbury Wheel and Mfg. Co. is marketing an up-to-date style of floating rear axle whose characteristic features include: a single annular ball bearing mounted externally on the axle sleeves and arranged directly under the spokes of the wheels; integral driving flanges on the outer ends of the driveshafts

which are secured to the flange bolts of the hubs; a differential and driving gear unit which is inserted through an opening in the pressed steel housing, and whose large bevel gear and differential mechanism may be separately removed as a unit from a similar opening at the rear of the axle; and two sets of internal expanding brakes, arranged concentric with each other, and operating on individual drums. The brake-operating rods are separate and run parallel with each other, and are brought in toward the center of the axle so that the connecting rods will be inside of the chassis frame. A triangular torque member is used in connection with it. Annular ball bearings are used throughout.

Collins—The Collins axle, made by the Collins Axle Mfg. Co., differs radically from any of the conventional axle designs now on the market in that it furnishes a direct drive to the driving wheels on all speeds. This change gear mechanism, giving two speeds forward and one reverse, may be contained in the same size axle housing that usually is employed for a single driving bevel gear and pinion with differential case, and weighs but little more. As shown in Fig. 18, the power is applied to the shaft P S, which carries the two driving pinions P and P1. Diametrically opposite these driving pinions two idler pinions P2 and P3 of the same numbers of teeth, are placed. These idler pinions engage the same gears as the driving pinion and form a gear chain, whereby all angular thrust is counteracted and the load automatically distributed over all the gears engaged, regardless of which is clutched with the differential housing.

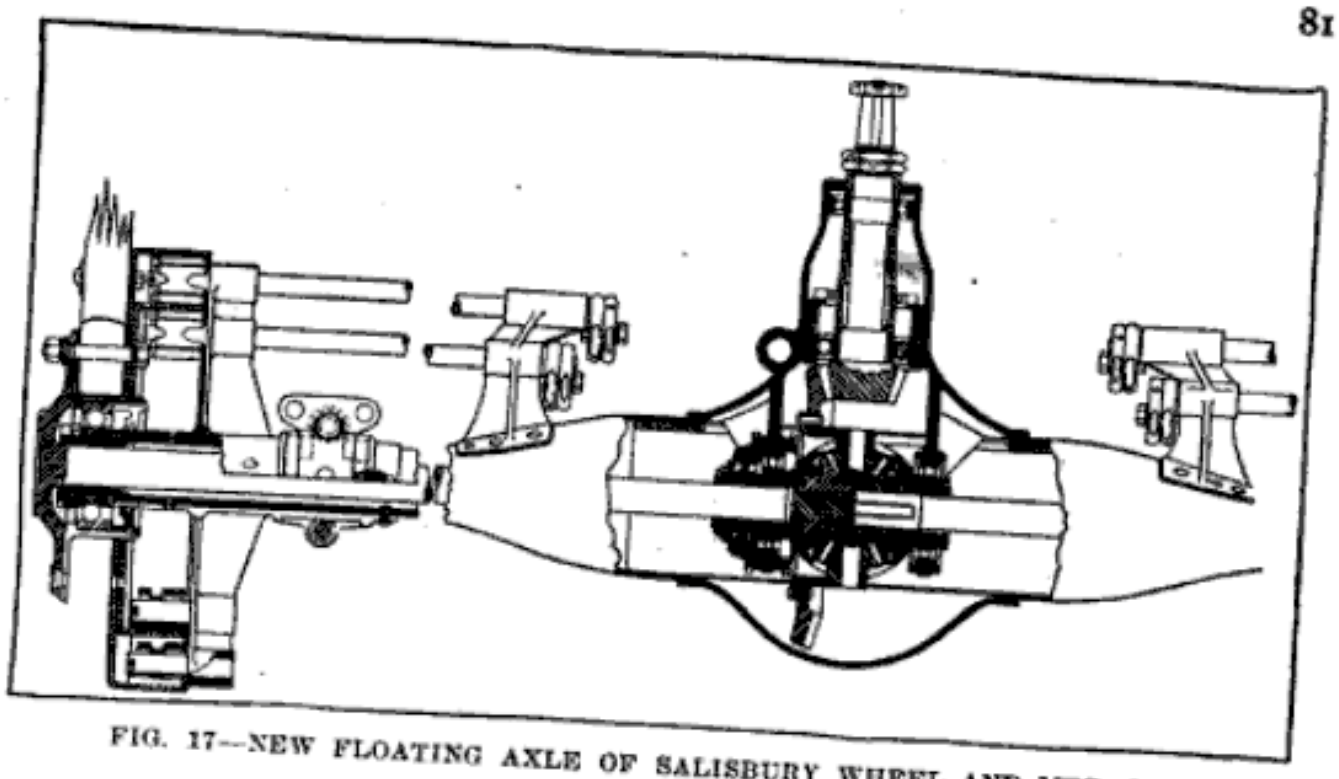

FIG. 17—NEW FLOATING AXLE OF SALISBURY WHEEL AND MFG. CO.

Thus if the low speed gear B is engaged by clutch K, the pinion P would drive that gear direct on the upper side, the power applied to shaft PS also would drive the high gear B, which in turn would drive pinion P2 and also the pinion P3, as they are in one piece, which means that the power is applied to opposite sides of the gear B, the pinion P pushing down and the pinion P3 lifting up. It is impossible to break the teeth of one of the driving pinions without breaking teeth of the other at the same time, therefore it should be possible to carry double the load which ordinarily can be applied. The low speed pinion P drives downward on the low speed forward gear B and upwards on the reverse gear B2, which eliminates all bending stresses to the driveshaft. This also shows that power is transmitted to the idler pinions through the reverse gear. It is impossible to get any of the gears out of alignment as the entire mechanism is self-contained, each driven gear floats between two drive pinions, and is carried directly on the differential housing when engaged by one of the clutches.

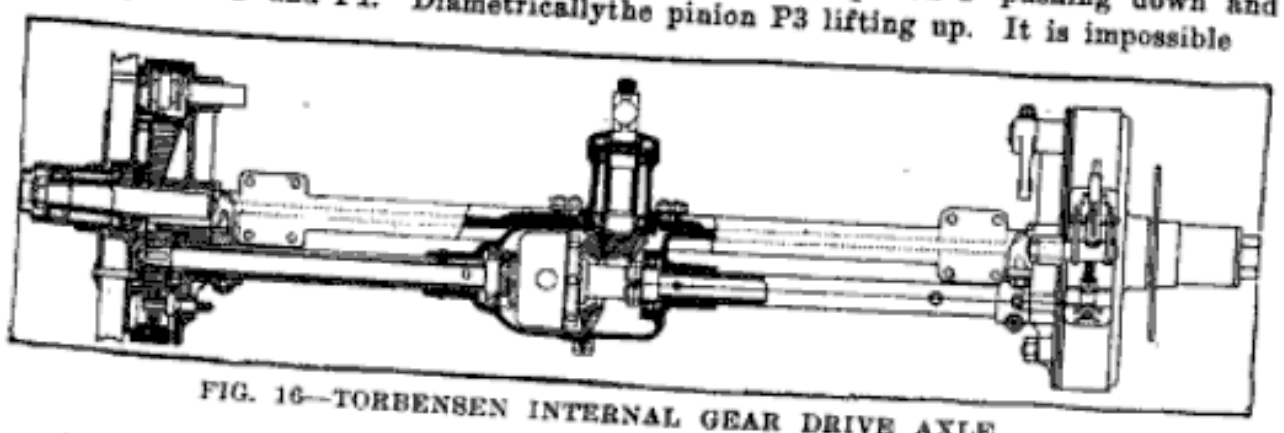

FIG. 16—TORBENSEN INTERNAL GEAR DRIVE AXLE

Torbensen—Torbensen Gear and Axle Co. is now making three sizes of the Torbensen transmission axle for delivery wagons ranging from 1,000 to 1,500 pounds capacity up to and including trucks of 3-ton load capacity. The Torbensen axle, Fig. 16, is a radical departure from the ordinary in that it is a combination of dead, I-beam axle and jackshaft, with the wheels bearing on the ends of the dead axle and driven through internal gears and pinions on the ends of the jackshaft. In this construction the axle proper is a solid and continuous piece from one wheel to the other. It is preferably made of I-beam section, drop forged of a special grade of steel having great toughness and high elastic limit. This I-beam carries the load, and to it and behind it is fastened the jackshaft in such a manner that it forms a component part of it.

The driving gears are entirely inclosed

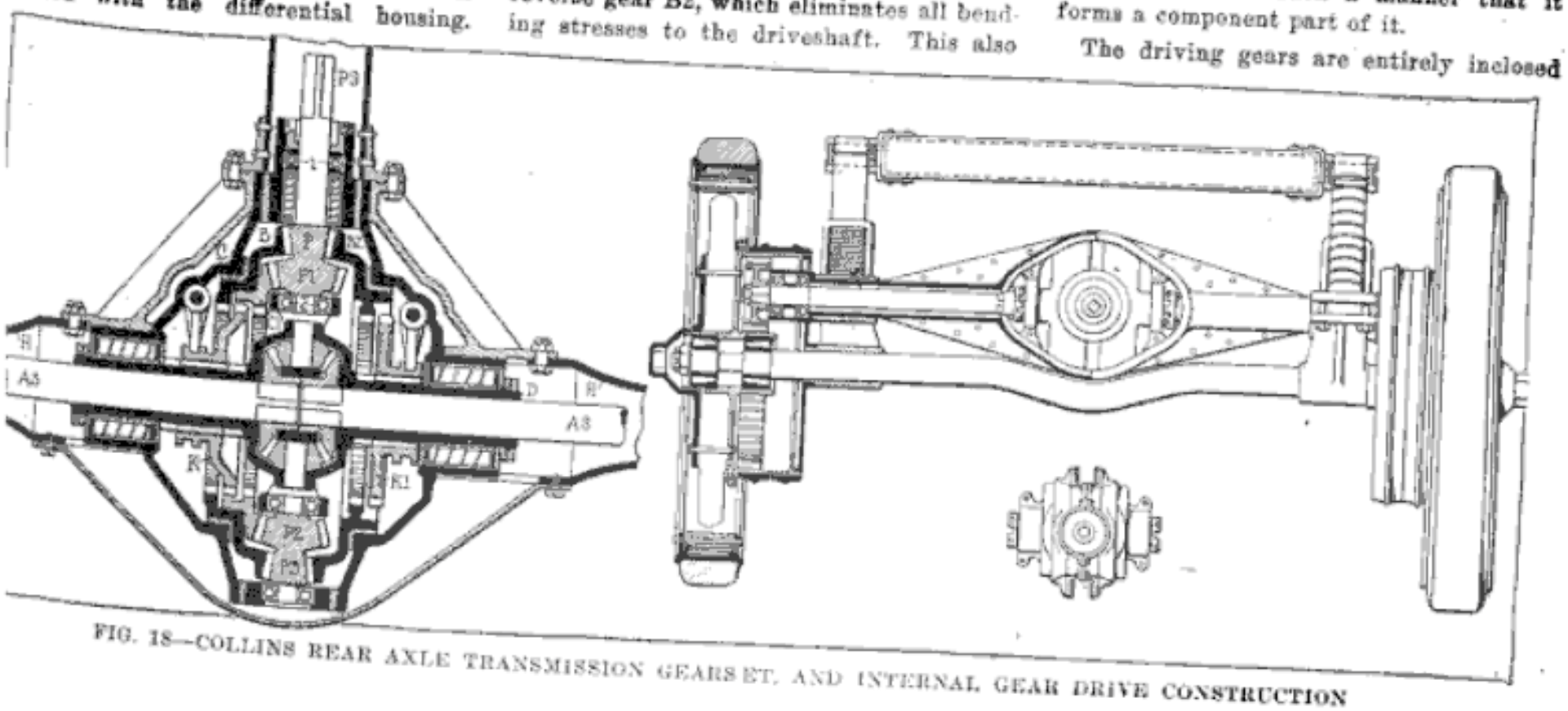

FIG. 18—COLLINS REAR AXLE TRANSMISSION GEARSET, AND INTERNAL GEAR DRIVE CONSTRUCTION

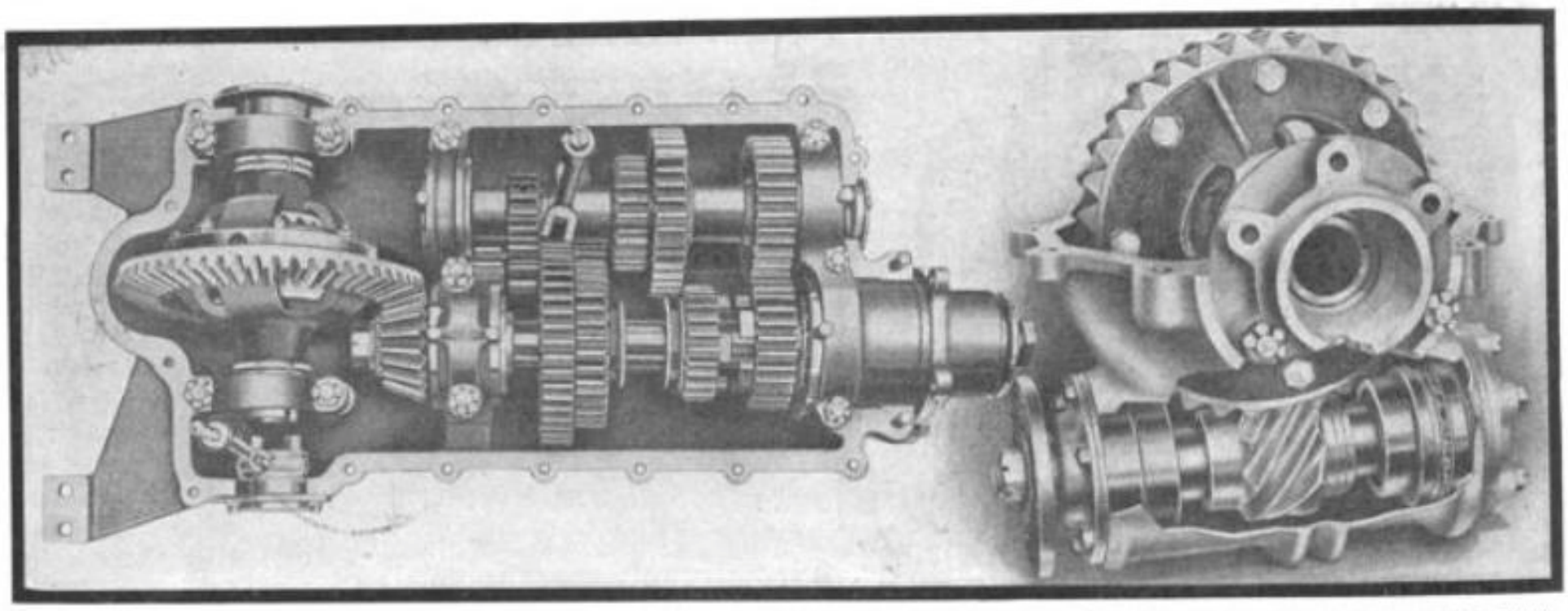

FIG. 1—WARNER GEAR CO.'S NEW COMMERCIAL VEHICLE GEARSET AND LANCHESTER WORM-DRIVE DIFFERENTIAL UNIT

and work in lubricant, and on absolutely fixed centers maintain in perfect pitch and parallelism, under any conditions to which they are subjected in service. The bearings throughout in both the jackshaft and hubs are of the parallel roller or ball type as preferred, and the load capacity of each bearing is much in excess of actual requirements.

It is of special interest to note that the main speed reduction takes place directly at the hubs of the driving wheels so that the rotative speed of the engine is but little reduced till it reaches the hubs of the driving wheels, which permits of the use of a jackshaft having bevel driving gears, differential, casing, etc., considerably smaller and lighter in weight than the ordinary jackshaft in use with the chain drive. Brakes are of very large diameter and surface. They are of the external contracting and internal expanding type, both operating on the same drum. No braking strains are transmitted through the gearing, so that no matter how suddenly and carelessly they may be applied no damage can occur to the transmission mechanism.

Liggett—Solid drop forged front and rear axles are a feature of the Liggett Spring and Axle Co.'s line for 1912. This company makes I-beam and square axles for both pleasure and commercial vehicles and also I-beam and square rear axles for chain-driven vehicles complete with hubs, roller bearings, brakes, sprockets and strut rods. The company also makes a rear shaft drive axle of the floating type which, like all Liggett axles, is equipped with roller bearings.

Ross Differentials—Spur gear differential mechanisms are a feature of the Ross Gear and Tool Co.'s line of motor car axle equipment. These differentials are of the bevel gear type, with the gears made of 3½ per cent electric furnace nickel steel. The gears inside the differential housing are bushed on hard bronze bushings. Both the pins supporting the differential pinions and the bolts holding the differential together are of nickel steel.

Stutz—The Stutz Auto Parts Co. manufactures rear transmission systems, comprising a unit propellor shaft, torsion tube, selective sliding transmission gearset, and semi-floating rear axle. The transmission housing is of cast aluminum and both the transmission and the greater part of the driving and differential gear housing is cast in one unit. This not only affords great rigidity, but allows all machining to be done by one jigging, which insures all bearing seats being machined in perfect alignment. The whole system is double trussed to withstand severe road shocks. New Departure ball bearings of liberal size are used throughout the transmission gearset and the driving gear unit also is mounted upon them. The propellor shaft runs on Hyatt roller bearings. The differential gear is of the bevel type with large coarse pitch gears and internal mechanisms which are protected from dirt and water, and designed to run in an oil bath. Grease cups are freely used on all outside moving parts. This equipment is made in two sizes, one designated type A for cars of 25 horsepower and under, and the other type B for vehicles of 40 horsepower and under. In order to meet a commercial demand in the field the company makes both of these types for jackshaft purposes.

B & L Caster Front Axle—The Queen Mfg. Co.'s axle differs radically from the ordinary design of front axle, in that the king bolt on which the steering knuckle is pivoted, is placed ⅜ of an inch forward of the center of the wheel hub, instead of 3½ inches to one side of the hub center. The advantages claimed for this construction over those of the older designs now in most general use include easier steering, better control, much less liability of the spindle being broken, one-quarter less space required in which to turn the car around, wheels turn on a perfect pivot, control just as easy on sandy or muddy roads as on smooth highway, and other advantages of this nature.

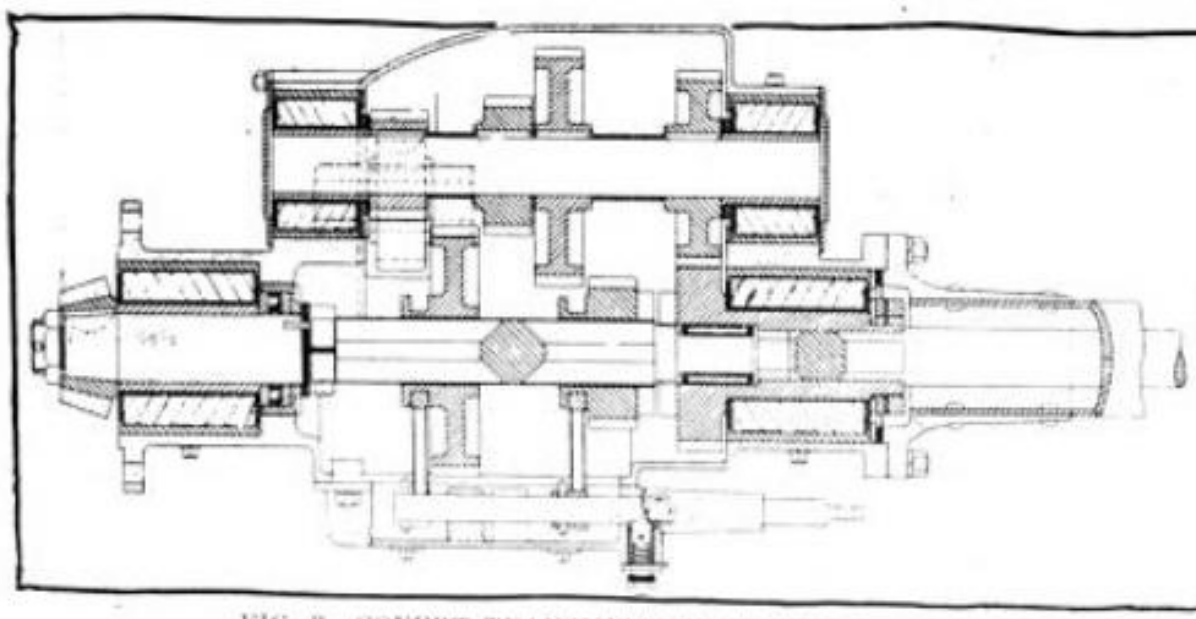

FIG. 2—COVERT TRANSMISSION GEARSET

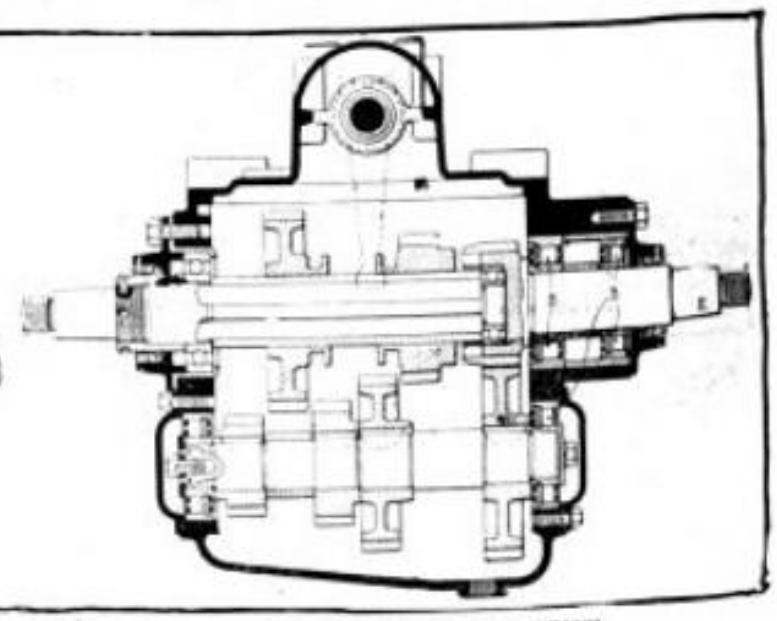

FIG. 3—BUDA GEARSET