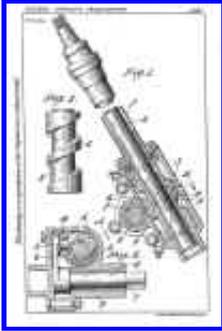


## Bishop Cam Steering Box

**GB 223963 “Improvements in or relating to gearing for steering mechanically-propelled vehicles and for other purposes”**

This, a patent for a steering box, was applied for on July 25 1923 and has a publication date of 27 October 1924. The patent holder was Reginald Bishop, a Middlesex engineer, for a device operationally consisting of a cam of helical form and constant diameter (at the lower end of the inner steering column) imparting motion via a roller or peg attached to a lever projecting from the steering rocker shaft. Yes, it's the old Bishop Cam steering box.



*Click for large image*

Before World War 2, most British cars were fitted with one of three proprietary steering boxes, the Bishop Cam, the Burman-Douglas worm and nut, or the Marles. Arguably, the Bishop Cam was the most basic (a polite word for crude). It was fitted to Morris and MG's among others, and has long been cursed by T-series MG owners for its wooliness and vagueness. Around 1937, Vauxhall actually abandoned it, choosing instead the Burman-Douglas.

Well, from the 1954 season (and possibly a few cars before), Morgan switched from the Burman-Douglas to a “new” Cam Gears steering box, which continued in use for quite a few years until the advent of the Gemmer and Jack Knight rack and pinion systems. Simply, the Cam Gears box is the Bishop Cam box made by Cam Gears Ltd, or, after a 1965 takeover, TRW Cam Gears Ltd. The Morgan factory at one stage marketed a conversion kit to fit this device to earlier cars.

If you look hard at your Cam Gears box you may find “BISHOPS GEAR “ and the patent number etched on the top cover or cast into the left hand side housing.

In detailing the three boxes, the “Service Station and Motor Mechanics’ Manual” (1940) implies that the Burman worm and nut box is much superior to the Bishop Cam, a feeling reflected by some Austin A30 owners also (the A30 also changed to Cam Gears in the early 1950's).

So, why did Morgan switch to a technically inferior product dating back to the 1920's? This is largely speculation, but the Cam gears box is simpler, cruder, and presumably and importantly cheaper. Also, post-war Burman worm and nut boxes were of appalling quality, and arguably much worse than their pre-war counterparts.

However, “Spin Doctoring” was in vogue even then. Both the “Autocar” and “Autosport” tests of May and August 1954 talk somewhat eulogistically of the new “cam and lever” steering box, and Harvey, in “Morgan: the Last Survivor” talks of replacement of the “old Burman worm and nut steering box which had survived since pre-war days, with a more sophisticated Cam Gears cam and peg system...” Oh dear!

(Special thanks to Laurie Burton for retrieving his old Cam Gears box for a look-see)

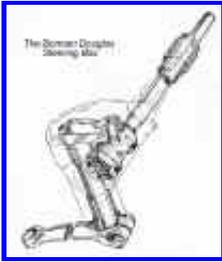
## Burman-Douglas Steering Box

**GB 361204 (US 1893764) “Improvements in or Relating to Steering Gear”**

A sports commentator and noted tautologist once spoke of a player making “forward progress”. This story's a bit like making progress by going backwards, and gives a glimpse into spin-doctoring as practised in the middle of last century.

Previously, we've examined how, from around 1954 Morgan adopted a Bishop Cam steering gear provided by Cam Gears Ltd., and made to a 1924 patent.

Our current Prattle covers the Burman-Douglas worm and nut steering box, used in Morgan 4-wheelers from 1936 to 1954 (a few very early cars used a reduction gear



mounted halfway down the column). The patent for it (GB 361204) was filed on 16 September 1931 and published in January 1933. That's 9 years after the steering box Morgan adopted later! The Burman-Douglas is the more sophisticated and complex design, and our motoring forbears seem to have thought it was a lot better - until they moved backwards to the Bishop Cam, that is...

The "Service Station and Motor Mechanics' Manual" (1941), in a treatise covering Bishop Cam, Marles (later Marles-Weller) and Burman-Douglas designs comments:

*Click for large image*

"The Burman-Douglas steering gear ... is looked upon by experts

as being one of the most perfect types of steering gear in existence. As an outstanding indication of its efficiency, it may be quoted that it was the steering gear used by Sir Malcolm Campbell in his "Bluebird" when he established the world's land record of over 300 miles per hour.

The Burman-Douglas gear was designed by a British engineer who had had long experience of the manufacture and use of steering gears of many different types..."

The patent holder was John George Douglas of Luton, Bedfordshire. The design was claimed as a refinement of earlier worm and nut systems, in part to eliminate lost motion in them...

There are some marked differences, however, between the manufactured box as we know it and the patent specifications. The most significant is that the production boxes have no adjustment for wear (except for end-float in the column). The patent does have provision for wear adjustment, the nut being split circumferentially and longitudinally to permit wear to be taken up by tightening screws accessible simply by removing caps in the box casing. Also, as we know it, the nut is located and held in position as a sliding fit inside the casing, wear here being another factor contributing to slop in the system. In the Patent, the inner column, and hence the nut, is located and held in place by a spigot on the end plate at the bottom of the box.

But then, in the convoluted logic of the afore-mentioned publication:

"...This tremendous bearing area between the main nut and inner column gives an obvious tendency toward long life. So great is this contact area, that the maximum load and speed can never break down the oil film."

Later, however, the article goes into some detail about procedures to be followed when wear takes place between the nut and inner column...

So, why was the Burman-Douglas box dropped from 1954 for what publicists then claimed was an improved and more sophisticated product? As far as I can glean, Morgan's spin was that the post-war Burman-Douglas boxes were of appalling quality (they were right!). But perhaps there's a bit more to it than this. The replacement Cam Gears box is a cruder and simpler device - perhaps it was cheaper to buy. Then, too, the Austin A30 made the same move at about the same time, suggesting there may have been a problem with continuing supplies (some A30 owners consider the Burman the better box). After World War 11, the Burman Gear Co was supplying the industry with larger and more sophisticated recirculating ball designs - perhaps they deemed it uneconomic to continue production of the older worm and nut devices?