pendent parts, 1 and 2, of one part conductor being carried by insulators, 3, while the similar parts, 4 and 5, of the other part conductor are carried by similar insulators, 6.

Fig. 2 shows how electrical connection is established between the engine and the parts of the conductor. Insulators, 29 and 30, similar to those previously referred to, respectively carry the parts of the conductor, 27 and 28. The trolley wheels, 33 and 41, are carried by a frame, 35, upon the engine, and each runs upon one of the parts of the conductor. The frame is insulated from the engine but the trolley wheels are connected by wires, 43, with a motor, 44, upon the spindle of which is a worm, 48, gearing with a worm wheel, 49, upon the spindle, 50, of the starting lever, 51. The starting lever, by an ingenious arrangement, is capable of being worked independently of the worm wheel. The wires also lead to a solenoid actuating a whistle and an electric lamp, 46. A constantly running dynamo of small power is actuated in the wire circuit, 43.

It is now necessary to refer to Fig. 3 which diagrammatically illustrates what happens when two locomotives, 61 and 62, are running towards each other upon the same line of rails, one of the locomotives having a constantly running dynamo, 64, and the other a similar dynamo, 65. The locomotives are each provided with a trolley wheel, 66 and 68, respectively, running upon the conductor, 67, and both have the signalling and stopping apparatus shown in Fig. 2.

While the trolley wheels are running upon insulated segments of the conductor the dynamos are not generating effective current; but when a circuit is completed through the segment by means of the trolley wheel of one locomotive arriving upon the same segment as the trolley wheel of the other locomotive, then electricity is immediately generated, which actuates the apparatuses indicated, so that the steam is turned off, the whistle blown and the electric lamp illuminated displaying a danger signal.

Those who have some electrical knowledge will see how readily the conductor may be availed of for signalling under various conditions. For instance, any one or a number of segments may be earthed so that when a vehicle carrying means of generating a current of electricity comes in contact with an earth segment through the medium of the trolley wheel described, a current of electricity passes from the generator through the segment to earth through the earthing medium, and back to the generator through a rail of the permanent way or otherwise.

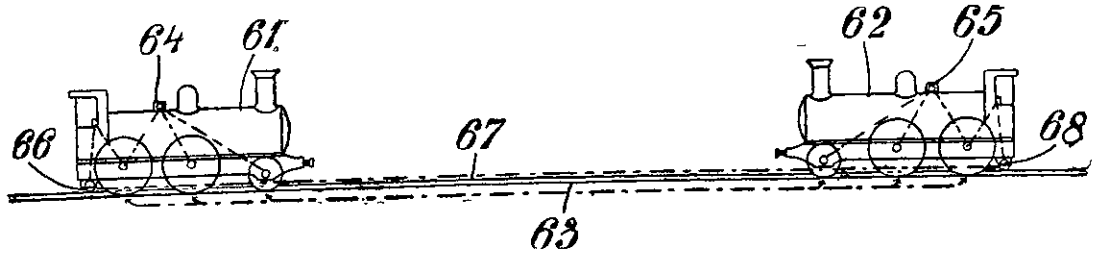
During its passage the current may be used for illuminating an electric lamp, sounding a whistle, actuating brake apparatus, etc.

THE BRITISH EMPIRE.

A CENSUS OF ENORMOUS PROPORTIONS.

FOUR HUNDRED MILLION PEOPLE—RELIGIONS, MARRIAGE RATES, AND OTHER FIGURES.

"THE Truth about the British Empire! Price 3s. 5d." So might run the advertisement of a recent Blue Book if so unthinkable a consummation as the competition of Blue Books with the ordinary mass of literature for the favour of the public were ever to come to pass. As it is, this Blue Book bears the formal title of "Census of the British Empire, 1901." It is a deeply interesting inventory—all the more interesting if the reader will imagine the hearts beating behind those solid piles of figures that show the condition of an Empire which covers one-fifth of the land surface of the globe. It is shown that in forty years (1861–1901) the area of the Empire has grown from 8,500,000 square miles to 11,908,378, and the population from 259,000,000, to 398,401,704. To this vast total the United Kingdom itself contributes only a population of 41,458,721 and an area of 121,089. Excepting, however, only the Isle of Man and the Channel Islands, there are more persons to the square mile in the United Kingdom than in any other part of the Empire, the next densest being the Indian Empire with its population of 294,361,056, or 172 persons per square mile. Canada's proportion is only 1.4 and Australia's 1.3—a fact which shows eloquently how great an amount of unoccupied land is still available for the Empire's settlers. There are in the Empire 187 cities or towns with a population of over 50,000. Of these eighty-seven are in the United Kingdom, seventy-eight in India, seven in Australasia, five in the Dominion of Canada, two in the West Indies, two in the Straits Settlements, and one apiece in the Colonies of Hong Kong, Ceylon, Mauritius, Cape of Good Hope, Natal, and the Transvaal. The most populous city next to London is Calcutta—848,000, an increase of 166,000 in ten years. In New South Wales, Victoria, and Western Australia more than half the population are in urban areas, while in New Zealand, South Australia, Queensland, and Tasmania the preponderance is in the rural areas. In Canada the greater proportion of the population live in rural areas, and the same rule holds good in South Africa. But in the United Kingdom 71 per cent of the population live in towns,



BUCKERIDGE SIGNALLING SYSTEM, FIG. 3.

the proportions in the three divisions of the Kingdom being 31 per cent. in Ireland, 70 per cent. in Scotland, and 77 per cent in England and Wales.

In India, out of 1000 males over fifteen years of age, 708 are married, and 1000 females over fifteen 669 are married. The following table shows the proportions of unmarried, married, and widowed in the United Kingdom and in some of the principal Colonies and Dependencies:

	Proportion per 1000 living.		
	Unmarried.	Married.	Widowed.
United Kingdom ..	609 ..	334 ..	57
Indian Empire ..	419 ..	465 ..	116
Cape of Good Hope	649 ..	307 ..	44
Orange River Colony	664 ..	309 ..	27
Canada	617 ..	341 ..	42
New South Wales ..	657 ..	303 ..	40
Victoria	647 ..	300 ..	53
Queensland	677 ..	289 ..	34
South Australia ..	652 ..	304 ..	44
Western Australia	647 ..	320 ..	33
New Zealand ..	657 ..	306 ..	37

Analysis of the occupations of the people shows that 2.2 per cent. of the male population of England and Wales are employed on railways, 2.7 on roads, and 0.8 on seas, rivers, and canals. The information under the head of "Birthplaces" shows that the proportion of Colonials who were born in the United Kingdom is in New Zealand 25.2 per cent. of the population, in the Australian Commonwealth 17.7 per cent., in Canada 7.3 per cent., and in the Cape Colony 3.7 per cent With regard to religions, it is estimated that there are 57½ millions in the Empire professing the Christian religion, and over 295 millions professing "non-Christian religions." The seven greatest religious groups in the Empire may be stated thus

Hindu	208,342,276
Mahommedan	62,884,811
Christian	57,500,000
Buddhist	11,643,432
Primitive Animistic, Pagan ..	8,910,826
Sikh	2,195,444
Jain	1,334,148

A Gaseous Hydride of Calcium Present in Commercial Acetylene.

Acetylene prepared from certain samples of commercial calcium carbide deposited calcium oxide, even after careful filtration and purification. A systematic examination of a large volume of this acetylene was made, and the gas was passed successively through wash-bottles containing acetone and ammoniacal cuprous solutions, the latter being used to absorb the acetylene itself. Finally, a volatile residue was obtained which burnt in air to calcium oxide and water, and, therefore, appears to be a gaseous hydride of calcium. Since, however, this gas has not been completely freed from air, its exact percentage composition is still in doubt. (*Zeitschrift fur Anorganische Chemie*, 1906, vol. 48, p. 137).

The names of Kepler and Leibnitz recall how genius of the highest order was neglected in former days. John Kepler, as Carlyle reminds us, "did not fare sumptuously among Rodolph's astrologers and fire-eaters, but perished of want, after discovering the true System of the Stars." Poor Leibnitz, nearly a century later, in 1716, was buried at Hanover, with one mourner to do him honour, his late secretary. In the French Academy only was a fitting tribute paid to one of the most illustrious men of the age.

Electrically Operated Cable Winches.

Electric cable winches have recently been employed by the German Telegraph Department for drawing in underground cables. The insertion of the cables into the cement conduits previously required ten or twelve men. The electrically-operated winch gear is distributed over two cars—viz., a smaller car carrying a benzine motor of 6 h.p. capacity, actuating a dynamo, and a larger car containing the 3 h.p. electromotor and the winch. The latter is provided with a self-acting cut-out. The haul upon the cables is accurately regulated by electrical adjustments with the results quite unattainable with a direct-acting benzine motor. The heaviest cable, 200 mm. in length, can be laid in about seven minutes