as interesting as it is important, for if a fracture of minutest extent should exist in any tin the fault is at once detected by the tester, who taps every tin with a steel bar which draws a clear ringing note from the former. All being well, the goods are finally sent to the Store, where lacquering and labelling conjointly assist in giving the tins their finished appearance and correct designation. If stowed away from boilers and other heat-producing media canned goods of the Gear quality will, it is claimed, retain their virtue for an indefinite period. The merit of goods canned at these works under the supervision already described is so high that the Company is enabled to prove the loss in packing at as low a figure as one quarter per cent.

All tinsmithing is conducted on the upper floor of the Preserving Works, there being five body-presses for cutting out the bodies, tops and bottoms of tins. Interchangeable dies are, of course, fitted to these presses, and an automatic soldering machine operates at the rate of 2,000 an hour.

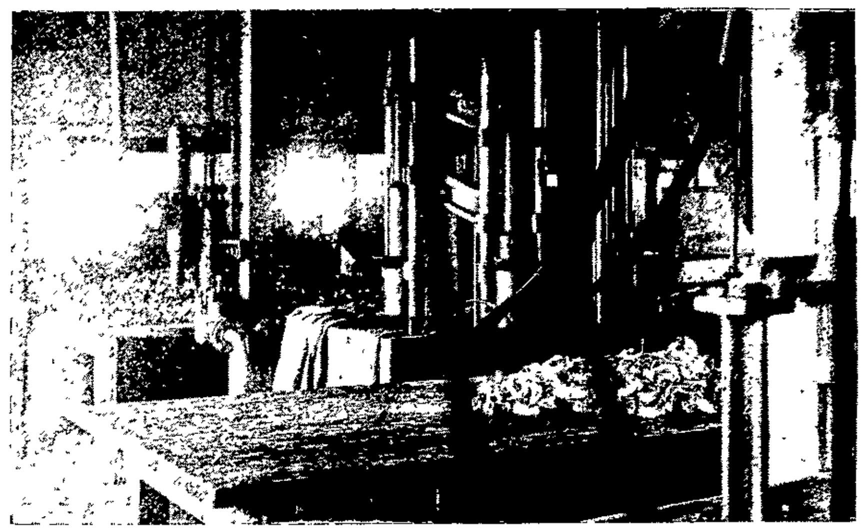
THE ENGINE ROOM AND BOILER HOUSE.

In such a huge establishment as the Gear works it is accepted that the power to drive the innumerable machines used in the host of processes must be considerable. Electric motors of which there are thirty-five, ranging from 1 to 30 h.p. each, are used in all departments of the works—the Engine Room, 95 x 65ft., being utilised as the central station. The electric power plant comprises three sets: one of 150 k.w., consisting of a Belliss & Morcom compound engine and Siemens generator; one 60-k.w. set with Ransomes, Sims & Jefferies engine and Crompton generator, and one 40-k.w. set by the same makers, the current being at 110 volts pressure, and the number of lights supplied 1,200. There are two switchboards—one a Kelvin-White and the other a Crompton. The refrigerating machinery includes one of Hall's carbonic machines, and a converted Haslam, these machines having a capacity of 2,000 and 5,000 sheep per diem respectively. The auxiliaries in the Engine Room are all of the most modern type, and are composed of two Weir feed pumps; Kennedy feed-water meter; four Gwynne circulating pumps; Deane condenser; air compressor having a capacity of 70ft. per minute; two large pressure pumps for the works and fire purposes; Cameron compressor pump with a capacity of 400 gallons per minute; and a Worthington pump of 200 gallons. There is also a Hall's carbonic-acid gas plant with a capacity of 350lbs for eight hours.

The Boiler Room, which is 65 x 75ft., contains six boilers, placed in two nests, one of four and the other of two. Two of these boilers are by Luke, two by Cable, and two by Sparrow, and they are equipped with Sturtevant's fans, a Hotchkiss water circulator, which deposits all sediment in a bulb on the top of the boiler, while Green's economisers are fitted for the purpose of heating the feed water up to a high temperature. Adjoining the Engine Room and Boiler House are the Joiner's Shop, 25 x 75ft., in which all the office furniture required at the works is made, in addition to the usual work turned out; Lathe Room, 25 x 50ft.; Turning Shop, 25 x 35ft.; Blacksmith's Shop, 25 x 20ft., containing two forges and one steam hammer; Boilermaker's Shop, 25 x 25ft.; Electrician's Workshop, 25 x 30ft.; and Plumber's Iron Store, 25 x 40ft. All the new buildings, including the iron roofs, have been designed, and the work done, by the Company's staff.

According to the last balance sheet of the Company the capital subscribed is £146,000, of which £92,000 has been paid up. The directors are —Messrs. James Gear (chairman), D. Anderson, H. Beauchamp, H. D. Bell, J. R. Blair, A. K. Newman, and N. Reid. Mr. W. H. Millward is managing director, and Mr W H. Tripe secretary of the Company. The heads of the departments, who have placed every facility before us in the making of this article, are —Messrs. W. G. Lodder, Chief Engineer, Freezing Works; E. C. Corner, Slaughter Yard and Tallow Department; S. V. Burridge, Fellmongery, J. G. Castle, Preserving, A. Carter, Chemist and Analyst, Manure Department; and T. H. Brown, Shops.

GEAR WORKS: EQUIPPED FOR WORKING IN THE FREEZING CHAMBER.



GEAR WORKS A GLIMPSE OF THE PRESERVING DEPARTMENT.

POWER TRANSMISSION.

BY W. G. MANNERS C.E., KALGOORLIE, W.A.

IN consequence of having been brought into contact with this subject, when reporting on machinery, I have been forcibly struck with the lamentable lack of knowledge possessed by many engineers, and the consequent waste of power and money in this direction. Of all the methods of transmitting power, including wheel gear, sprocket gear, chains, ropes and belts the latter is undoubtedly the best and, unfortunately, the least understood.

An ordinary straight belt drive, to give good results, must be as follows:—

The respective shafts must be truly parallel.

The pulleys must be absolutely in line.

The belt must be sufficiently large to transmit the required power without slip, or the use of resin, grease or any sticky substance.

The belt must be pliable and of even texture, and should run slack, without slip and it must receive proper care and handling.

The smallest departure from the accuracy in the lining of the shaft will remove the periphery of the pulley from the centre to one of the sides, and cause the belt to run off. The average engineer's remedy for this is to place a prop or bar against the side of the belt to keep it on, and thus destroy the belt in a few hours. One would hardly think it necessary to suggest that the proper course is to correct the error in the shafting, or pulleys, as the case may be.

Nothing is saved by first getting a small or cheap belt to do the work, and then spending the difference of cost in the purchase of "stick-fast" and other preparations to prevent slippage. Leaving out the cost of such preparations, the loss due to slippage and extra wear on the belt are factors that are not easily calculated, and thus engineers are not blamed for this ridiculous extravagance and waste. No engineer should be tolerated who uses sticky preparations on belts, or permits a belt to slip longer than is absolutely necessary.

To estimate the loss of power through slippage, one must check the revolutions of the driven, against those of the driving, pulley; and engineers would be surprised at the results in many cases. Imagine a 50-head battery, designed to run 100 drops per minute, and crushing 5 tons per stamp per 24 hours, losing on an average 2 drops per minute through slippage. Thus is 2% of the work lost for the expenditure of the full power, or 5 tons of ore per day, or 150 tons per month; and in my experience this is a low estimate.

One does not need to count the revolutions to ascertain if power is lost, through slippage. Any one, engineer or otherwise, can see at a glance if this is so. If the pulley surface be bright like polished silver the belts slips. If it has a dead lead colour the belt is doing good work. These are invariable rules and no engineer should neglect them. The cushion of air retained between a flat, solid belt often causes slippage. This may be obviated by using a link belt in which the air escapes between the links.

It is better to use a wide, thin belt, than a narrow, thick one, because a thick solid belt cannot hug the pulley to obtain a grip. This is especially true of small pulleys. Thus pulleys should be as large and wide as possible and should not have flanges. The pulley should alway be wider than the belt to allow as much play as possible. A belt should always have a large margin of strength, as an overworked belt is soon destroyed and does not give full efficiency at any time.

Engineers frequently make the mistake of putting on a belt extra tight, when it fails to perform the work required. This often results in a torn belt, and causes so much friction in the bearings that as much power is lost as if the belt had slipped. Unless a belt can be run slack the only true remedy is to get a wider belt or one that will not slip. The cost of wider pulleys will soon compensate the owner by the saving in power costs. The economy obtained by running belts slack is a considerable item, consisting of saving in wear and tear of the belt, horse power, hot bearings, grinding of shafts and bearings, and a quantity of lubricating oil. These are important factors in the compilation of power costs and are strong arguments against the use of small or cheap, inefficient belts.

The lap joint in a belt is also a source of trouble especially in a belt that is liable to stretch, much time being lost in taking up the joint. The uneven strain on the lap joint due to the outside lap having a greater strain while turning the pulley, is frequently the cause of breakage of the joint, which soon necessitates a piece being put in to make up the length, and then the trouble is increased by having two joints to repair. The butt joint, especially with zig-zag holes and good laces, is better than the lap joint. The laces on the driving side should be lengthwise with the belt. Many belt fasteners are on the market but few are any use. Those that join the belt with a flush butt joint are the best, but owing to the small amount of hold they are not so strong as the main body of the belt, and soon give out; where there is no spare length, the two-joint trouble ensues. A link belt obviates this efficiency as well as the slippage, and gives the highest efficiency of any known drive. Leather and raw-hide link belts stretch to some extent, but a link belt that will not stretch should be an ideal drive, as such a belt would have all the attributes of success.

The total revenue of the Natal Government Railways for 1905 amounted to £1,933,933 19s. 4d., as against £2,561,551 10s. 5d. for the year 1904, showing in comparison a decrease of 24.50 per cent. The working expenditure amounted to £1,531,210 5s. 10d., compared with £1,791,107 18s. for 1904—a decrease of 14.51 per cent.

The report of the American Steel Trust for 1905 shows a surplus of £8,600,000, as compared with £1,000,000 in 1904. The expenditure in 1905 in developing the new properties and improving the old was nearly £8,000,000, while for 1906 over £12,000,000 will be provided.

A new submarine, which is directed from the shore, or from a battleship, by means of electrical waves, has finished its trials at Antibes, and is said to have fulfilled the expectations of its inventor, M. Lalande. The vessel carries a torpedo tube, which the operator also controls from the transmitting station.