belt man then determines the proper method of fixing them. He may decide to cut, clean, dress or repair the belt. Counter and motor belts are inspected while the machines are stopped each week. All split laps and other necessary repairs are made at that time.

The belt man must bear constantly in mind that a large part of his responsibility is to keep the wheels of the machinery turning at all times. Therefore, preparedness must be his motto. Whenever he leaves the belt shop, he should leave a card in his window stating where he may be found. He should also have a portable repair kit which contains all the tools necessary to do whatever work on a belt may be required, and pieces of belt or extra belt for making repairs or replacements on short notice.

All belting which is discarded by the operating department should be sent to the belt shop to be examined by the belt man. He may be able to rework part of it by cleaning, cutting or cementing so that, with other short lengths cemented from time to time, the belting can be replaced on the type of machine from which it was taken. Or, he may decide to cut down the width of the belt because of a ruffled edge. Out of small pieces, he perhaps can make bumpers and power straps for looms.

The belt man is required to keep some records and make a few simple reports. A tickler card is made out for each working day. As the belt man puts on a new belt, he also notes on the tickler card the symbol or location of the belt and the nature of the work to be done on it. New belts are inspected for tension at intervals of twenty-four to forty-eight hours, one week, or two weeks. All motor and counter belts, certain representative machine belts and all special or test belts have a separate belt record card. The purpose of this record is to give a representative cross section of belt performance in the entire plant. For this purpose it is much better to keep a relatively small number of cards well than to have many of indifferent value. These cards show an accurate record of performance of certain types of belting under various types of load, humidity conditions, etc. Many belts on cards, roving frames, spinning frames and looms do not require individual belt record cards. In order to keep a record of the rate of replacement on these belts by classes a belt renewal record was designed. The purpose of the belting cost record is to provide information from which material can be gathered for a complete record on the cost of belt maintenance over an extended period of time. By including on this sheet the cost of material and the labor time of taking speeds, cleaning and greasing belts, etc., this can be made of great value in actually determining the value of a belt system.

We have found there is often a loss of 7 per cent in machine speeds due to belts, and hence a loss in production. Therefore, on scheduled time at least once a month the belt man takes the speeds of the major producing machines in the mill and compares them with standards. If he cannot bring the machine up to standard speed through the medium of the belt, he determines the reason, such as a change of twist gears, and notes it.

The dimensions of the equipment, as well as the tools, in the belt room have been carefully studied to produce efficient workmanship. The room contains a desk for the various records, a preparing table for skiving, etc., a cementing table, a belt press table and press, a receiving table, belt and tool racks and tools and supplies.

The system of belt maintenance was inaugurated at our Thrift Division. The man employed for this purpose was sent to a reputable belt manufacturing plant for a sufficient length of time to allow him to acquire information on standard methods of treating belting, working up pieces into long lengths, etc. Consequently, as belt systems were started at the other divisions, they sent their men to Thrift for two weeks, or as long as was necessary, to absorb the proper methods of working up belting and to install in their mills the Kendall Company belt system.

Belt charts, showing the location of all belts in the mill, pulley sizes and speeds, belt widths and thickness, shifting location and size, are a valuable adjunct to any belt maintenance program.

3. *Electrical Equipment.* All electrical equipment in the plant, starting at the transformers and carrying through the incoming lines, the switchboard, distributing line, fuses, disconnects, compensators or controllers, and the motors themselves should be subject to systematic and thoroughgoing inspection by the electrician at stated intervals.

In this paper only the motor inspection will be referred to. The motor record card was designed to record the essential data about each and every motor in the plant. The motors in the plant are numbered and the numbers entered on the motor card. Whenever a motor is repaired, the nature of the repair should be indicated in the "Remarks" column. In order to give a complete story in a minimum amount of space, the following symbols are used to indicate different classes of repairs: A—general overhauling, i.e., remove end shields, clean out bearings, clean and varnish windings, reassemble and paint motor; B—replace front bearing; C—replace rear bearing; D—repair rotor.

Whenever motors have been overhauled or inspected, the condition of the insulation is recorded. The condition is found, first, by observation of the windings and a note made as to whether there is any sign of abrasion, cracking, oiliness, etc., and second, by the use of an electrical instrument known as a "meg." The meg is an exceptionally valuable instrument for preventing unexpected motor failure, because it is designed to give an indication of the condition of the insulation in a motor by measuring the electrical resistance of the insulation in ohms. The indicating scale on the meg starts at zero. The first indication is 10,000 ohms; the second 50,000 ohms, and so on up to 800,000 ohms. The next indication is one megohm, equal to one million ohms. The scale then continues in megohms up to one hundred megohms and the final mark of infinity corresponding to perfect insulation. The insulation of a good motor ought to be over five megohms. Any motor which shows a test of over five megohms may be considered in excellent condition and almost certainly will run without further attention for six months or a year, always providing there are no accidents. A motor wherein the motor insulation test is one megohm is in doubtful condition. It must be remembered that this is still a very high insulation and the motor may go for months, even years, without breaking down. Such a test, however, does indicate that deterioration has taken place and is a danger sign indicating that the motor should be watched closely and the insulation tested frequently, probably three or four times a year. If each successive test shows a lower value than that of the preceding test, it is a positive indication that the insulation is deteriorating, and that within a relatively short time the motor will fail. It is, therefore, wise to remove such a motor from service at once. If a motor, on first test, indicates a resistance of 100,000 ohms or less, it should be removed from service at once and rewound.

4. *Village Inspection.* For the comfort of the operatives, as well as in an attempt to avoid major expenditures on houses, streets, etc., we have a predetermined schedule of village inspection along the same general lines as in the mills. The inspection covers such items as locks, screens, window sash, porch steps and floor, sills, chimneys, plumbing, etc., in the houses, and drainage ditches, sidewalks, streets, catch basins, trees, etc., in the village.

5. *Fire Protection.* The purposes of recording a systematic inspection of all fire protective equipment are more or less obvious. However, the proper maintenance of fire equipment is most important. The master mechanic, or someone selected by him, and approved by the mill manager, makes the inspection weekly. A specially prepared form is used as an aid and to assure the manager that no items are overlooked. Nothing is taken for granted. Each fire pail is checked, as are all valves, dry pipe alarm, fire pumps, automatic sprinklers, fire doors, hydrant houses and other equipment, water pressure, and general items which impress the inspector as fire hazards.

Materials Control

This subject in a cotton mill consists principally of a stores system for handling repairs and supply parts. These articles, of course, are not resale materials, such as cartons, paper, labels, etc., on which control is essential to keep merchandise fresh, but the same methods are applicable.

The necessity of controlling stores inventory is obvious. It might be interesting to know that in a plant we recently acquired, the inventory was over one and a quarter million dollars. Through stores control it has already been reduced over $300,000, and later it is certain to be lowered by an additional $200,000. At another plant, the turnover was increased from three to six times a year, which released half of its capital. In our Southern mills, we are operating on a two to one ratio of consumption to inventory, or an inventory turnover twice a year. For comparative purposes, a similar summary of ratios of each department of each mill, together with the dollars and cents value of consumption and inventories, is sent to each manager quarterly.