

Goods, and Hollow articles such as Balls and Toys—Seamless Tubing and Shaped Cord—Preparation of Sheet for "Mechanicals"—Press-cured Goods—Rubber Belting—Rubber Rollers—Pneumatic Inner Tubes and Tyres, Pedal and Brake Rubbers and Cab Tyres—Soft-rubber Surgical Goods, etc.—Enamelling Bands and Rings—Rubber Stamps—Water-proof Cloth—Imitation Leather Cloth—"Cut-sheet" Rubber Shoes—Insulated Wires and Cables—Compositions of Asbestos and Rubber—Eraser Rubber—Para Sheet and Elastic Thread.

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RUBBER MANUFACTURE.

INTRODUCTION.

IN accordance with the general scheme of this work, the scientific and theoretical portions have been purposely limited to what was absolutely necessary and essential, for the little that is known with scientific exactitude about rubber must still be looked upon as more or less fragmentary. The book, therefore, begins with a description of a convenient factory and plant, theoretical questions being generally dealt with in connection with the practical matters on which they bear, an arrangement which is likely to facilitate reference.

PLAN AND ARRANGEMENT OF A RUBBER-GOODS FACTORY.

In whatever sphere of industry a new enterprise be initiated it is essential, in these progressive times, that the fullest possible use be made of every real advance that has taken place and of every substantial improvement brought about within that sphere. The rubber industry is pre-eminently of that class which demands the greatest possible degree of perfection in mechanical equipment, if the universal competition of to-day is to be successfully met, and at the same time a first-class product is to be put on the market. As everyone interested in the matter is aware, the success of any given class of rubber goods is largely a matter of confidence on the part of the buyer, and a new product can only make its way side by side with others already known if it offers some advantages to buyers. The only way, however, in which it becomes possible to offer such advantages, without detriment to profits, is by so adjusting plant and equipment as to reduce the wages bill to a minimum, by the adoption of economical methods of manufacture, and by avoiding waste. In the first place, the buildings should be so arranged that the separate workshops, in which the different stages in the process of manufacture are carried through, are continuous with

one another. Extensive subdivision is not desirable. The different branches of manufacture cannot well be separated from one another without interfering with the possibility of general supervision. A further very important point is with reference to the dust which is produced during certain operations, and which is scattered about the shop. In all processes of "making-up" rubber goods it is most important to exclude, as far as possible, every trace of dust, in order

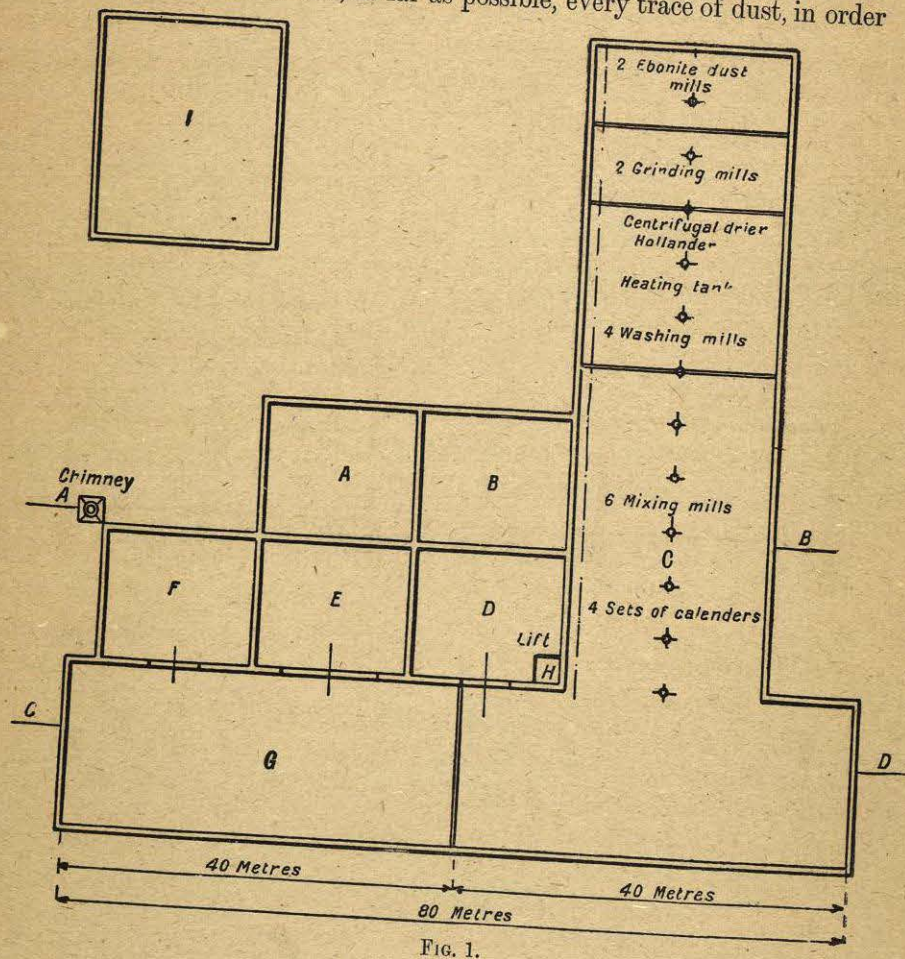


FIG. 1.

to produce a thoroughly sound and serviceable article. An air-cushion, for example, is of no use whatever if it develop leaky seams, owing to particles of dust settling on the solutioned edges of the rubber sheet while the article is being made up. On this account a building with an upper floor is to be recommended, so that all those branches of manufacture which must be kept free from dust can be put into separate isolated shops. There still exist many works which are arranged in just such a primitive fashion

as would serve the purpose of a smithy. One of the principal sources of trouble arises from the roughness of the walls, on which the dust settles, only to be disturbed by the slightest draught, settling again on fabrics and rubber.

The engines and boilers should occupy a central position, and the vulcanising plant should be situated close to the boiler-house. The mills, again, should be near the engine by which they are driven, so that the main shaft with which they gear may be driven direct. In selecting the machinery for the works, one's chief care should be to procure only such machines as will, by their use, lead to economy in labour. The advantages of particular machines will be indicated when dealing

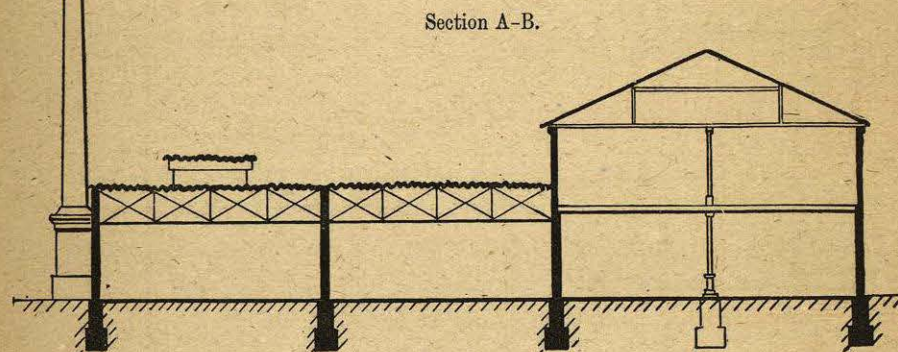


FIG. 2, A.

with the separate branches of manufacture, and sundry faults in construction will also be referred to.

Fig. 1 shows the ground-plan of a factory, fig. 2, A and B, sectional elevations, and with the help of these the reader will be able to form a clear mental picture from the following description. The logical method in explaining the ground-plan is to begin with the steam-production, or with the motive power, and to follow this up with descriptions of the shops in the order in which they are concerned in the actual processes of manufacture. In accordance with the manufacturing sequence, theoretical chapters on vulcanisation and mixings are inserted after that which deals with the raw material.

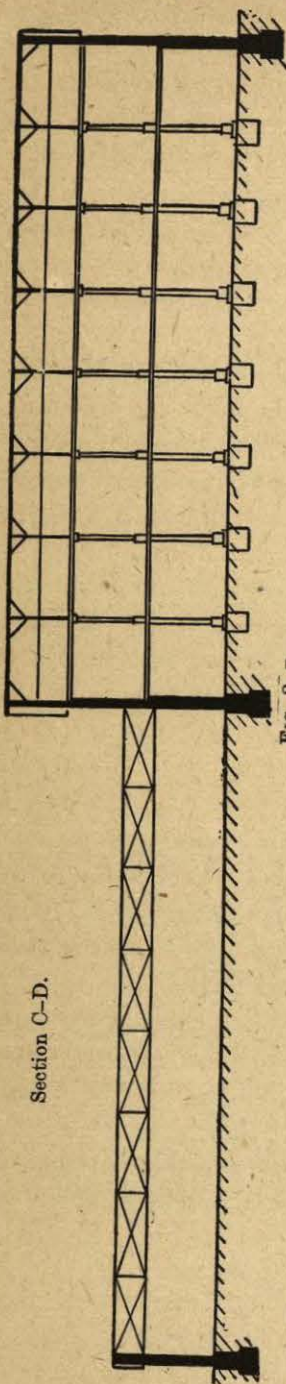
Boiler-house and Engine-room, and Space-distribution generally.—

The buildings marked A and B in fig. 1 serve to house the boilers and engines for the production of steam and power, and of electric energy for lighting purposes. Each of these separate buildings is 7 metres high, and is covered with a span roof of girder-work.

Building A contains the Cornish boilers, of about 100 square

metres heating-surface, and the superheater. Steam for the engines is generated in two boilers working at 180 lbs. pressure, whilst the other boilers, working at 150 lbs., provide the steam required for vulcanisation. The use of fire-tube boilers is certainly much more rational in a rubber factory than that of water-tube boilers, because in the case of the former the great consumption of steam which takes place in the vulcanising processes, through the continual opening and closing of the vulcanising apparatus, can be more readily compensated than in the case of the latter, the steam-space of the fire-tube boiler being by far the greater. With water-tube boilers, on the other hand, in spite of their greater heating surface, the irregular steam-consumption results in much water being carried over, a circumstance which, in the first place, is opposed to economical working, and, secondly, may be detrimental to the goods undergoing vulcanisation; we shall make special reference to this point again later on. The boiler-house is so arranged that it can be enlarged without difficulty, so that additional boilers may be conveniently introduced at any time. Great value is to be attached to the superheater, so that dry steam can always be used in the vulcanising heaters. Besides the boilers there are also in this building the feed-pumps, the water-softener, and the oil-separator for condensed steam.

The engine-room B, fig. 1, like the boiler-house, of which it is in a sense a continuation, is 7 metres high by 15 metres wide; its length is 12 metres. The triple-expansion engine housed in it drives the main shaft of the machine-room C (rope drive), together with a 100-H.P. generator used for driving the machinery in other



rooms. A generator for lighting purposes, together with a battery of accumulators, is also situated in the engine-room.

The storeyed building C adjoins the engine-room B and the vulcanising shop D. In this building are contained the mills and various other machines, which are arranged in sets. The mixing mills and calenders are not enclosed in any way, but the spaces containing the washing plant, the grinding and waste mills, are separated by means of glazed partitions. Adjoining these is the plant for the preparation of substitutes and surrogates, followed by the sheet-cutting shop, and finally by the mixing-room and store for the batches of mixed rubber.

In the room C, which is not subdivided, and which is the machine-room proper, places are found for the following, in addition to the mills and calenders: all lathes and drills as well as tube machines and other heavy machinery for the "mechanical department," with the exception of machines for making hose and tubing with insertion.

The hose shop and the "mechanicals" department are in the building G, which runs along the ends of C, D, E and F. The hose shop, 40 metres long, is constructed with a span roof 15 metres wide, and adjoins a storeyed building. The hose shop should be built on the ground-level with a span roof so that the hose-mandrels can be manipulated in it without difficulty. The vulcanising shop, which is subdivided into three compartments, is situated, as already pointed out, next to the boiler-house, in order to avoid having to carry the steam an unnecessary distance to the heaters. Compartment D contains the vulcanising "pipes" (autoclaves), while the presses are in compartment F. Between these two rooms is room E, which is used as a moulding shop.

The rooms on the upper floor are used for making up sundry articles, such as balls, surgical goods, ebonite goods, waterproof goods, etc. They are in direct communication with the vulcanising shop by means of the lift H.

The spreading-machines and also the ebonite-dust plant are located in a separate building I. The office buildings adjoin the factory buildings G.