

THE UTILIZATION OF WASTE AND BY-PRODUCTS.

In the last census report of the United States is an article by Henry G. Kittredge, a part of which is of greater or less interest to the lumber trade. He goes into details as to the various uses that are made of what was formerly thrown into the waste pile at the saw mills, and tells of other articles of commerce that are now extracted from or made of wood that was formerly considered of little or no value. The article is in part as follows:

Nothing in the arts of manufacture is more indicative of economic efficiencies than the utilization of products that have been rejected as wastes or residues in the industrial processes. The acme of industrial economy is the profitable employment of every atom of material in whatever form it may be presented or however obtained. Every particle of an organic or inorganic substance has a useful part to play in contributing to human necessities or pleasures, and when it performs no function toward some useful end, or remains dormant, it shows that the ingenuity and enterprise of man have not reached their fullest development, or that the arts of the laboratory have not revealed all the secrets of nature. The refuse of to-day is a source of profit to-morrow; and this has been going on for years and probably will be going on for years to come, notwithstanding that even now there is little that is thrown aside as absolutely useless, except as it may be utilized in the economies of nature. New revelations and new uses are constantly being found for substances of all kinds, whether in their original forms or in their changed forms, due to outside agencies. The world's increment of wealth is largely dependent upon finding new and more economical uses for materials, however exalted or humble they may be in the industrial scale, and especially the elevation of the humble to a higher plane of appreciated usefulness. If a thing is unused for man's enjoyment, it is because it has not yet found its place of utility.

Nearly all of the formerly waste products of lumber and timber are now turned to some utility, and some of the new products thus formed are of considerable value. Of this latter class may be mentioned sawdust, which was formerly considered an absolute waste material, and was allowed to float down the stream or was thrown into a heap where it could be most conveniently disposed of. French cabinet makers have found a way of using this material which gives it a value

far above that of solid timber by a process that has been in vogue for at least twenty-five or thirty years, combining the use of the hydraulic press and the application of intense heat. By this process the particles of sawdust are formed into a solid mass capable of being molded into any shape, and of receiving a brilliant polish, and possessing a durability and a beauty of appearance not found in ebony, rosewood or mahogany. This product is known as "Bois durci." Artificial woodwork, therefore, seems to have a promising future. Alum, glue and sawdust kneaded with boiling water into a dough, and pressed into molds when dried, is hard and capable of taking on a fine polish. Ornaments of great beauty can be made from it very closely resembling carved woodwork.

The production of acetic acid, wood naphtha, and tar from sawdust is one of the latest enterprises in Norway. A factory has been

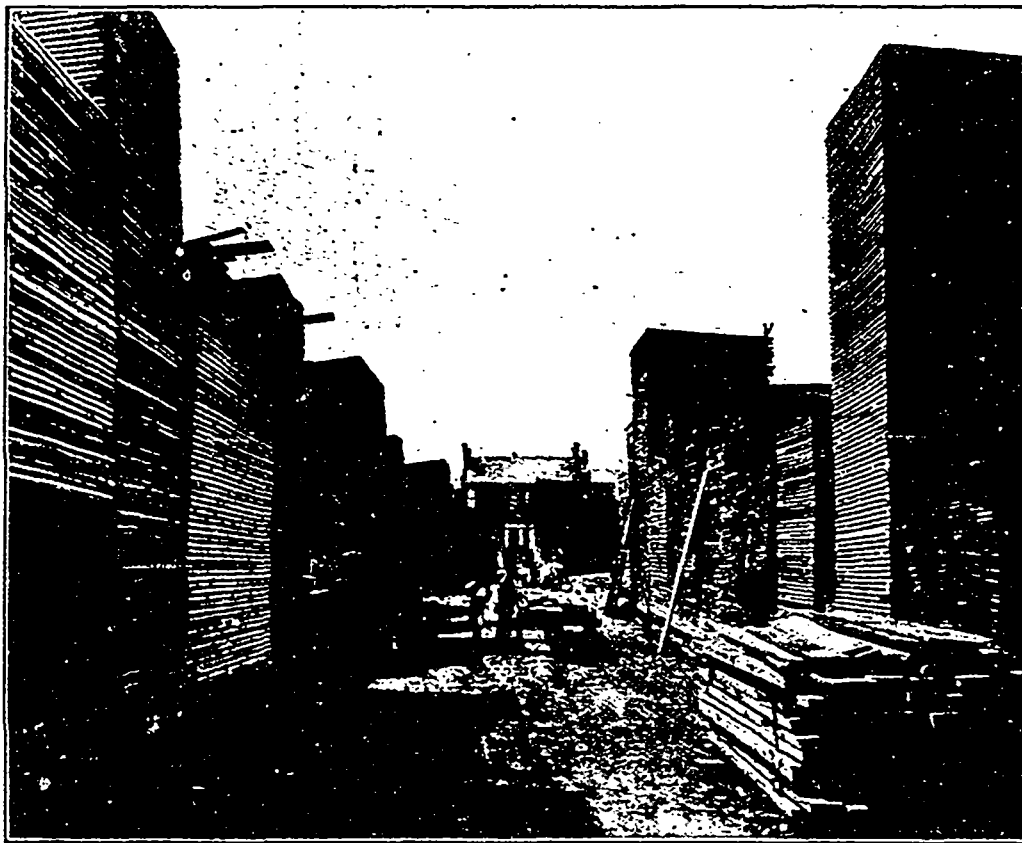
quantity of alcohol obtained from 220 pounds of air dried sawdust (25 per cent. water) was 7 to 8 quarts. The quality of the alcohol distilled from the fermented liquid was said to have been excellent and the preliminary experiments indicated that the trifling impurities found in it could be readily removed.

A patent taken out in England in 1896 for utilizing certain waste products of wood describes a process of constructing or manufacturing a product resembling wood from a mixture of sawdust or wood refuse and certain quantities of gums, resins, or other suitable agglutinants, either in a dry state or dissolved, the compound being subjected to pressure at a temperature sufficiently high to soften or melt the gums or resins.

According to the United States census of 1900 the amount of sawdust used in the clay and pottery industry of this country cost \$19,687, or 0.17 per cent. of the total cost of all the materials used.

The utilization of wood pulp in the manufacture of paper is not new, but its increased use is very marked, as will be seen by comparing the statistics of the census of 1890 with those of 1900, in the amount of raw materials used in the manufacture of paper. Early in 1826 the brothers Cappuccino, paper makers of Turin, discovered a means of supplying the need for paper making material, caused by the scarcity of rags in the fabrication of paper, by substituting the thin bark of the poplar, willow and other kinds of wood. The good quality of the paper made from this material was recognized by the Academy of Science, after an examination of the manufac-

tured product, and so important was the discovery considered that the king granted the brothers an exclusive privilege for ten years for the manufacture of paper from ligneous materials. In 1833 a patent was granted in England to J. V. Desgrand for making paper and pasteboard from wood reduced to a state of paste. Poplar wood was thought at that time the best for this purpose, as it had been in Italy twelve years previous. A patent was granted in 1855 to William Johnson for improvements in the application of various substances containing wood fiber, as the best, or inner bark, of the lime tree, the willow, birch and alder, to the manufacture of wood paper pulp. At the London International Exposition of 1862 Wurtemberg contributed several samples of paper made from wood pulp mixed with rags, the proportion of the former varying from 10 to 80 per cent.; and the paper was reported to be serviceable, although of a low



VIEW IN ONE OF THE YARDS OF THE M. BRENNAN & SONS MANUFACTURING COMPANY, HAMILTON.

started at Fredrikstad capable of distilling 10,000 tons of sawdust in a year. It also manufactures charcoal briquettes, which are exported to the Netherlands. The acids are chiefly placed on the German market, while the tar is mostly consumed at home. The factory is said to be the first of its kind erected in that country. According to an English patent of 1897 sawdust may be so prepared as to be non-inflammable, and then applied to jacketing of boilers and other purposes.

In the Journal of the Society of Chemical Industry for 1898 is described a series of experiments for obtaining alcohol from either coarse or fine sawdust, without affecting the yield. It was found that pine sawdust, as compared with fir sawdust, was superior, as yielding a purer alcohol. It was also found that a high yield of sugar was obtained from birch sawdust, the yield of sugar being about 30.8 per cent. of the quantity of birchwood used. The