SCIENTIFIC AMERICAN

[Entered at the Post Office of New York. N. Y., as Second Class Matter.]

A WEEKLY JOURNAL OF PRACTICAL INFORMATION. ART. SCIENCE. MECHANICS. CHEMISTRY AND MANUFACTURES.

Vol. XLIV.—No. 15. [NEW SERIES.] NEW YORK, APRIL 9, 1881. $3.20 per Annum. [POSTAGE PREPAID.

AMERICAN INDUSTRIES.—No. 70.

FLOUR MILLING.—THE ELECTRIC MIDDLINGS PURIFIER.

However simple in outward appearance, a grain of wheat exhibits, when looked into, a curious complexity of structure, organically as well as chemically; and the processes now employed in converting grain into flour are scarcely less complex and curious. Indeed, unless one has made a special study of modern milling he can have no idea of the many processes of reduction and purification a grain of wheat now undergoes between the bin and the flour barrel.

It is doubtful whether any other great industry has during the past ten years experienced so complete a revolution as flour making. For the previous half century or more, from the day when Oliver Evans set up the first automatic milling machinery in his mill on the Brandywine, the industry grew in volume and importance, but underwent no signal or radical improvement in machinery or processes. The non-progressive period came to an end about 1870; and since then change, and rapid radical change, has been the order of the day, at least in the great merchant mills, which turn out by far the larger and better portion of American flour.

The causes which led to the era of change were several, chief among them the conditions and exigencies of wheat growing in the new Northwest, the development of cheap railway communication with the seaboard, and the resulting possibility of competing with Austria and Hungary in supplying the flour markets of Western Europe. The problem was to make good white flour out of the spring wheat of Minnesota, and the processes of milling were revolutionized for its solution. To describe in detail even the more characteristic changes in the means and methods of milling thus brought about does not fall within the scope of this paper. It is necessary, however, to indicate roughly the more important of them to enable those of our readers who are not millers to appreciate the improvement in milling processes to be described and illustrated below.

Structurally the wheat kernel is composed of the following parts: (1) The light, straw like, valueless hull, comprising the three parts called *epidermis*, *epicarp*, and *endocarp*, together making about 3 per cent of the weight of the grain. (2.) The testa or episperm, which forms, with an underlying membrane, the inner skin of the berry. This part carries the coloring matter, and constitutes about 2 per cent of the weight. (3.) The germ and its membranous expansion, say 5 per cent; nutritious but not desirable in the flour, since it carries an oil likely to become rancid and injure the sweetness of the flour. (4.) The central or floury portion, 90 per cent, composed of starch and gluten variously combined. The heart is the softest, and contains the least gluten. In the successive layers around the center the proportion of gluten increases outward, the entire amount varying with the kind of grain, the quality of the crop, etc., etc.

The old process of milling involved but two distinct operations after the wheat had been cleaned—the grinding and the bolting, or separation of flour from bran. Three products were obtained: fine flour, more or less discolored by particles of 1 and 2; a coarser and more granular part, rich in gluten and dark in color, called middlings; and bran, more or less mixed with the other two.

To obtain the largest possible yield of flour the stones were set close together, or the upper stone "low." With soft, starchy, winter wheat, having a tough husk, low grinding gave excellent flour. With the hard and brittle hulled spring wheat the flour was mixed with so much fine bran, which could not be bolted out, that it was unpopular and unprofitable.

The new process was designed to remove these objections to the flour made from Minnesota wheat. The aim now became, not to make the most fine flour and the least middlings at a grinding, but the reverse; it being found that, when properly purified or freed from branny particles, the middlings

[*Continued on page* 226.]