RETROSPECT OF THE YEAR 1901.

(Continued from page 3.)

over a 3,000-mile cable. The year has served to bring prominently into notice and see firmly established the Burry and Murray telephone systems, both of which are of the page-printing type. The Murray system has been adopted by the Postal Telegraph Company, and it has achieved a speed of as many as 130 words per minute. The Burry system is particularly adapted to city work, for the distribution of news from a central to a large number of outlying offices. During the year the contract was placed for the construction of the Trans-Pacific Telegraph cable, connecting Australia direct with England, via Canada. The cable will run from England to Vancouver, thence to Queensland and New Zealand by Fanning Island, Fiji and Norfolk Island. Its total cost will be just under $10,000,000, and it is to be completed by 1902. In the telegraphic world the most worthy events have been those connected with the development of the Marconi system of wireless telegraphy, which has been successfully applied to warships and to the vessels of the merchant marine. Incoming ships have been reported off Nantucket, and put in communication with New York several hours before their voyage was completed, while passing ships of the Cunard Line have picked each other up in mid-ocean and have communicated until they were as much as 190 miles apart. In the closing days of the year Marconi succeeded in sending wireless telegraph messages from the coast of Cornwall to Newfoundland, over 2,000 miles of ocean. He arranged that the letter *S* should be repeated at stated intervals, and he has announced to the world that the letter was heard by means of a delicate telephone receiver at the prearranged intervals of time, and at the hours predetermined upon. In electrical traction the most interesting work has been connected with the development of the Ganz system, in which current of the high potential of 3,000 volts is employed directly to the motors. The most important installation is that of the Meridionel Railway Company in Northern Italy, on which this new system is employed. The experiments on one of the German government roads in high-speed electrical traction, in which three-phase system high-potential current is used direct at the motors, has had some successful preliminary trials, in which a speed of just slightly under 100 miles an hour has been achieved.

NAVAL AND MILITARY.

We have so recently described our progress in naval matters in the Special Edition of the SCIENTIFIC AMERICAN that it is not necessary to do more than refer the reader to our issue of December 14, on the Development of our Navy since the War with Spain. The most noted military success of the year was the complete destruction of a 12-inch Krupp plate by 12-inch high explosive shells. So effective were the filler and the fuse that 20 pounds of government high explosive was carried into the plate and burst as it was passing through, with the result that the plate was smashed to fragments. The Gathmann torpedo-shell, containing 500 pounds of guncotton, fired at a similar plate, failed to produce results that were in any way comparable.

BREAD-MAKING BY MACHINERY.

Although the art of making bread dates back to the most remote period of civilization, only within the last fifty years have its scientific aspects been systematically studied. With the classic labors of Liebig in the chemistry of fermentation, bread-making was radically changed. The baking of a loaf was no longer a matter of individual skill, but of scientific knowledge. By reason of this change of method the little cellar-bakery, in which bread of poor quality was only too often made, began to give place to the modern factory-bakery equipped with elaborate machinery and with ovens of improved construction. The result has been that bread has been vastly improved in quality and is now made in accordance with certain well-established chemical rules. To illustrate the methods which are followed in a well-equipped modern bread-factory, the present article is devoted to a description of the Fleischmann Vienna Model Bakery, which supplies New York with a large portion of its bread.

The raw material employed in the making of bread at the bakery in question consists principally of flour, yeast, milk, and water. For the finer varieties of bread, butter is used. The flour is piled in sacks to the number of six thousand in a large storeroom occupying the topmost floor of the factory building, and is composed of spring wheat, winter wheat, and pure rye. Although modern milling machinery has done much to improve the quality and cleanliness of flour before it reaches the consumer, the baker finds that it must be still further cleaned before it becomes fit for his purpose. Consequently an elaborate cleaning apparatus or "dresser" is employed, invented by the late Jonathan Mills, which so thoroughly refines the flour that even the finest fibers of the sack are removed in passing through the machine. The cleaning apparatus comprises essentially a system of hoppers, screens, conveyers, and bins.

The hoppers are located at one end of the flour-storage room; and into their mouths the flour is poured. At the lower tapered end of each hopper an adjustable rocking closure is suspended by rods, which closure permits the passage of a definite amount of material. As the rods swing from side to side the closure rocks and permits the flour to drop into a spiral conveyer, by which it is transferred into a rotary screen. As the flour is whirled around and mixed in this rapidly-turning screen, it is driven by its centrifugal force toward one end of the screen; but before it reaches that end it has sifted through the meshes. The foreign matter and impurities are left behind, and these alone emerge from the end of the screen, left open for that purpose. The sifted, cleaned flour is transferred by a screw-conveyer, mounted immediately below the rotary screen, to a bucket-elevator, by which it is raised to the flour-storage room and conveyed to four bins by way of separate chutes. As the one bin receives its charge, its chute is closed, so that the next bin may be filled. This cleaning apparatus is constantly in operation; for during a working-day some 200 barrels of flour must be refined.

The four bins in the storage-room are situated directly above four dough-mixing machines on the floor below. And to each mixing machine the flour is carried by a small screw-conveyer and a flexible pipe-like chute from the superposed bin. Above each machine is a tank in which cold and hot water are mixed until a temperature varying from 90 deg. in summer to 95 deg. in winter is attained. Into each mixing-machine 60 gallons of milk and water, previously mixed by a baker, 840 pounds of flour, 15 pounds of salt, and a suitable amount of yeast, are introduced to form what is technically called a "sponge." In the making of rye bread caraway seed is also mingled with the other material. For the finest varieties of bread, milk and butter are used, as we have already remarked.

Although the four mixing-machines differ somewhat in detail, the main elements of the construction are the same in all. Each machine comprises essentially an iron vessel mounted to swing, in which a double spiral dasher or mixer is mounted, and is turned through the medium of gearing driven by a belt and pulley from a countershaft. When the mixing-machine has received its charge of material, the belt is shifted from a loose to a fast pulley, whereupon the dashers turn and knead the sponge into dough. Human hands could never knead so thoroughly and so quickly. After twenty minutes of mixing and kneading, by which the ingredients are intimately commingled into a perfectly homogeneous mass, the mixing machine is swung downwardly on its axis, and from the turning dasher the dough is cut with a long-bladed knife and collected in a wheeled trough.

Time was when this kneading and mixing was done by hand. The workmen washed their hands and cleaned their nails before kneading and handling the dough. But it is hard to knead dough thoroughly by hand; and perspiration must break out from the pores with the arduous labor. By using mechanical kneaders the dough can be mixed, thoroughly kneaded, without touching it with the hands. How great is the saving in time and labor wrought by these machines may be conceived when it is considered that the work which each performs in twenty minutes required at one time the incessant labor of two men for three-quarters of an hour.

Before machinery was introduced in the making of bread a man worked from twelve to thirteen hours a day in a large bakery and from seventeen to eighteen hours in a small bakery. At present all large bakeries, at least those of New York city, employ their men only during sixty hours per week.

The dough collected from the mixing machines in the troughs is now allowed to ferment or "raise," as it is popularly called, a process which requires about two and a half hours. After fermentation the dough is ready to be molded by hand into loaves of some forty different shapes and sizes. Adequate machines for this purpose have never been devised.

From the mixing-room the fermented dough is dropped into a molding and oven room by chutes, the rye-bread dough passing down by one way, the wheat-bread dough by another. The rye-bread dough is carried to a table in the mixing-room, cut into pieces of a certain weight, dropped into a machine called a "break," and then passed down into the molding and baking room by way of a chute to be molded and baked. The "break" consists merely of a pair of rollers placed side by side, and serves the purpose of squeezing the air out of the dough.

The wheat-bread dough, on the other hand, is subjected to no squeezing, but is conveyed directly by a chute to a table, to be cut up and distributed among the men who are to work it into its proper shape. After having been molded into loaves the dough is allowed to raise in a steam-box for one-half an hour.

In the walls of the baking-room fifteen ovens are built into which the loaves are inserted by long-handled wooden shovels commonly called "peels." The baking extends over a period of one-half to three-quarters of an hour, depending upon the size of the loaf. The interior of the ovens is lit by gas to that the loaves can be readily seen. Of the various ovens employed, a large double Werner-Pfleiderer drawplate oven should be particularly mentioned; for it constitutes a most valuable adjunct to the baking plant.

The oven in question has two heating chambers arranged in as many tiers, and two carriages, each of which receives a baking plate and is run forward and back in its chamber. Hangers of different lengths extend from the forward ends of the carriages and are curved in the lower carriage so as not to impede the upper. These arms or hangers run on rails to guide the carriage into the oven. The construction utilizes the space in front of the oven to the best advantage; for large-sized baking plates may be drawn out to their full length.

After the baking the loaves are collected, classified, as it were, and taken to the shipping room. Here they are loaded on some fifty delivery wagons and distributed throughout the city of New York.

The output of this model bakery aggregates about 43,000 loaves of bread and 15,000 rolls per day.

Correspondence.

A Universal Language Again.

To the Editor of the SCIENTIFIC AMERICAN:

In your issue of December 21 Mr. George Wilson very decidedly affirms that "There can never be a universal language." He supports this contention by a number of statements that call for some comment. I quite agree with his first paragraph, in which he denounces the idea of reviving Latin, as a universal language; we have to-day an international language—the English—which is spoken by probably 140,000,000 of people, and the use of which is rapidly spreading. The idea of reviving a dead language, the pronunciation of which is almost unknown, and abolishing the leading language of civilization, seems absurd. But, so far as Mr. Wilson's other reasons against a universal language are concerned, I beg to object. Unless I am utterly at sea, there is no such difference in the human vocal organs as he imagines. If there were, would it not be impossible for Englishmen to learn French, or the reverse? But I have just been taking a course of pronunciation in French, and my Parisian teacher tells me that my sole difficulty lies, not in the need of the proper organs, but in my misuse of them; and he assures me that with a little practice I shall be able to speak French as well as himself. Mr. Wilson may deny this, but there are other facts. Our Canadian Premier, Mr. Laurier, speaks English and French equally well. How could this be if his vocal organs were only fitted to speak French? But a few weeks ago, Mr. Wu Ting-fang, the Chinese representative in the United States, was a frequent speaker at a variety of meetings, and, if one thing was more patent than another, it was that Mr. Wu could speak English not only with good taste and expression, but so as to be understood by the audiences better than most of the English-speaking orators. If there were any such differences in the vocal organs, we might expect them to be exhibited in negroes more acutely than in any other persons; but it is patent that educated negroes—apart from a certain thickness sometimes arising from thick lips, and sometimes also perceptible in white people—can speak English as well as whites.

The idea that climatic differences make such a change in the use of the vocal organs as to revolutionize a language is belied by common experience. A well-educated man or woman from England, Ireland or Scotland can only be distinguished from similar persons in Canada or the United States by their generally clearer and more definite pronunciation; and it is evident that variation in vowel sounds arises from other than climatic causes. If Mr. Wilson's contention holds good, all vowel sounds involving the wide opening of the mouth would have been discarded in high latitudes. I have traveled from Halifax, N. S., to Victoria, B. C., and have addressed audiences at many cities and towns between those far-distant places; and, while I was never able to detect anything more than the ordinary personal variations, I never had the slightest difficulty in making myself understood.

Whether a universal language be possible or desirable, I think most people will agree with me, that a language which possesses the immense literature now printed in the English tongue, which is spoken by more people than any other western language, and which is making immense and rapid strides in all quarters of the globe, bids fair to become such a language, if any one does. It might have local dialects, such as every language possesses and always has possessed; but this fact would not prevent the written and printed language being uniform, as is practically the case to-day all over the civilized world.

Toronto, December 21, 1901. J. SPENCER ELLIS.

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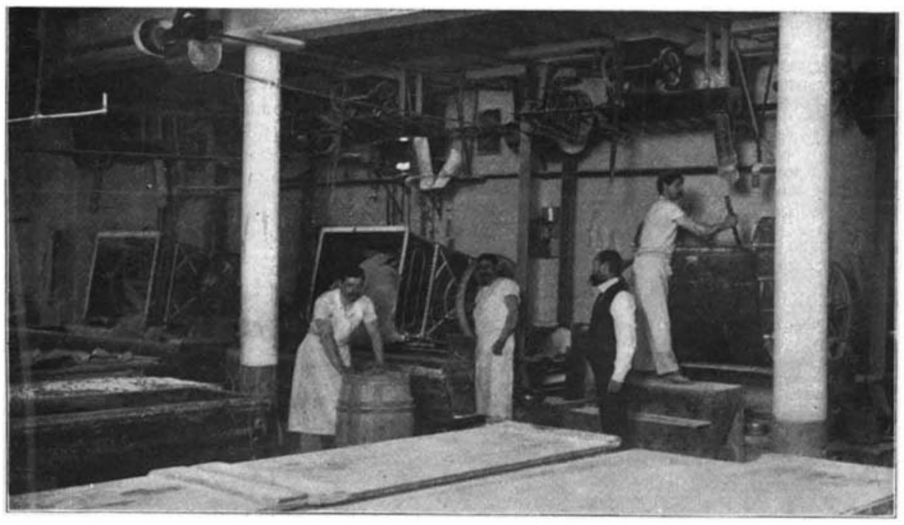
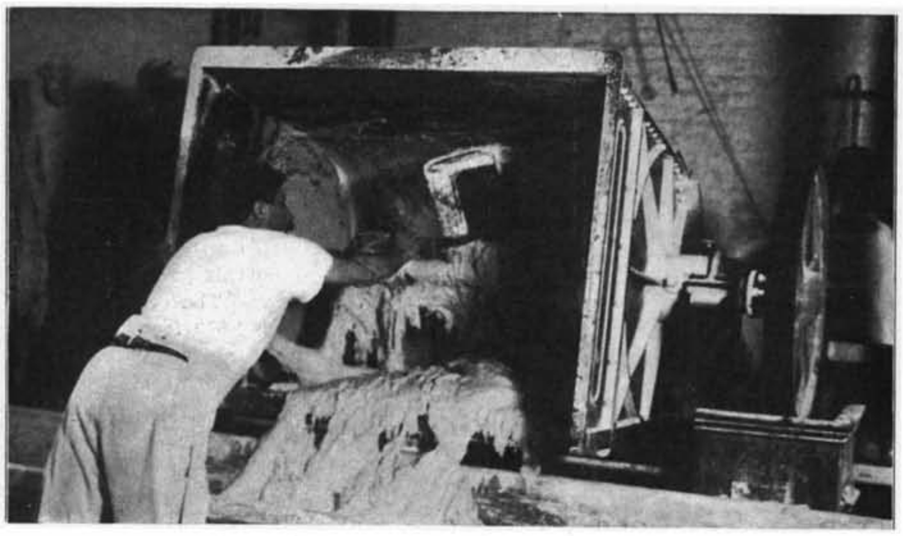
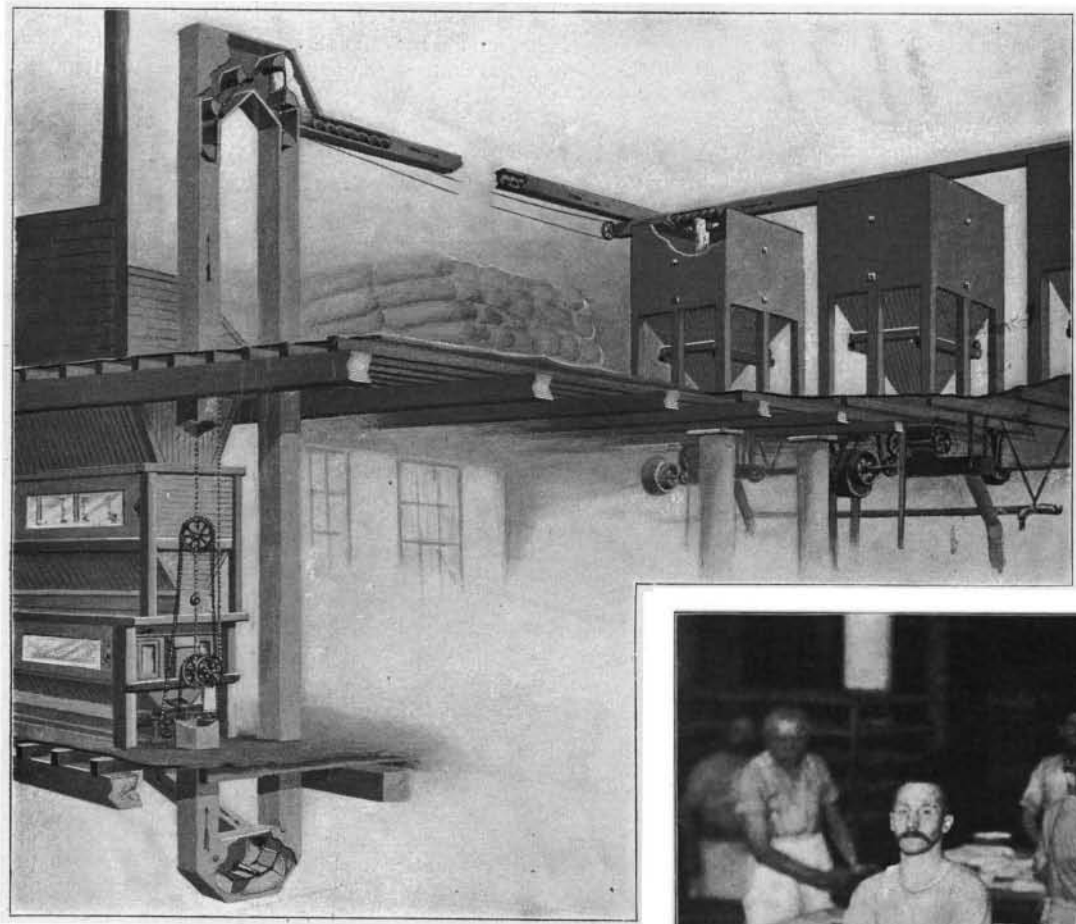


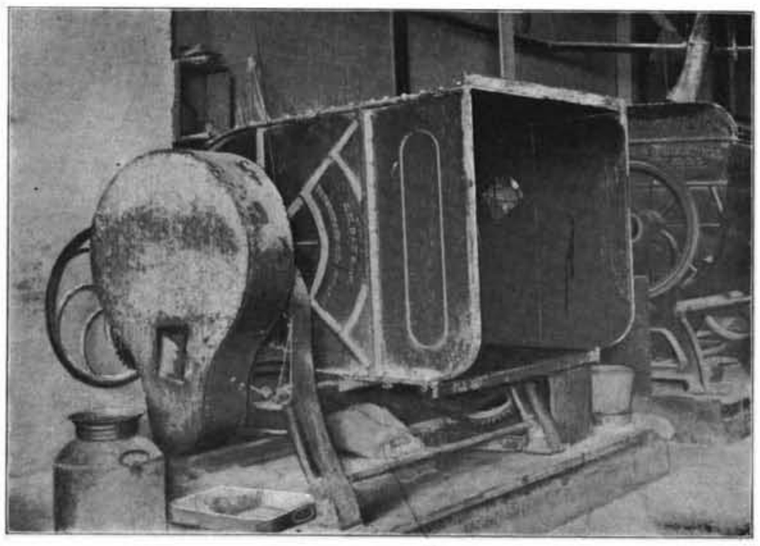
The Mixing-Machine and "Raising" Room.



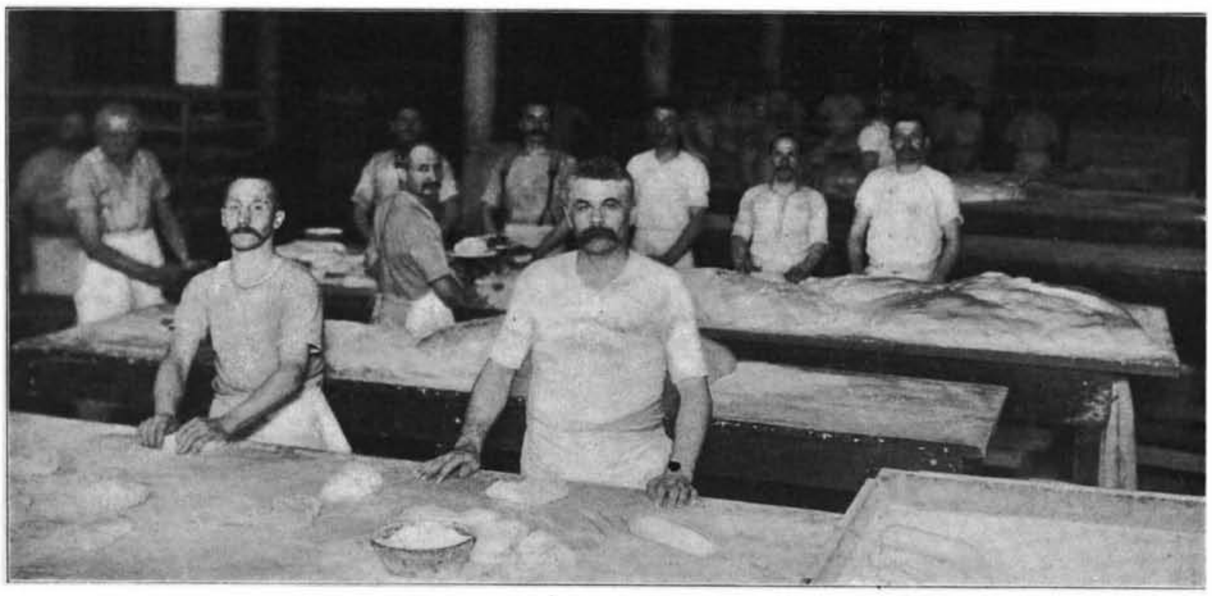
Cutting the Kneaded Dough from the Dashers.



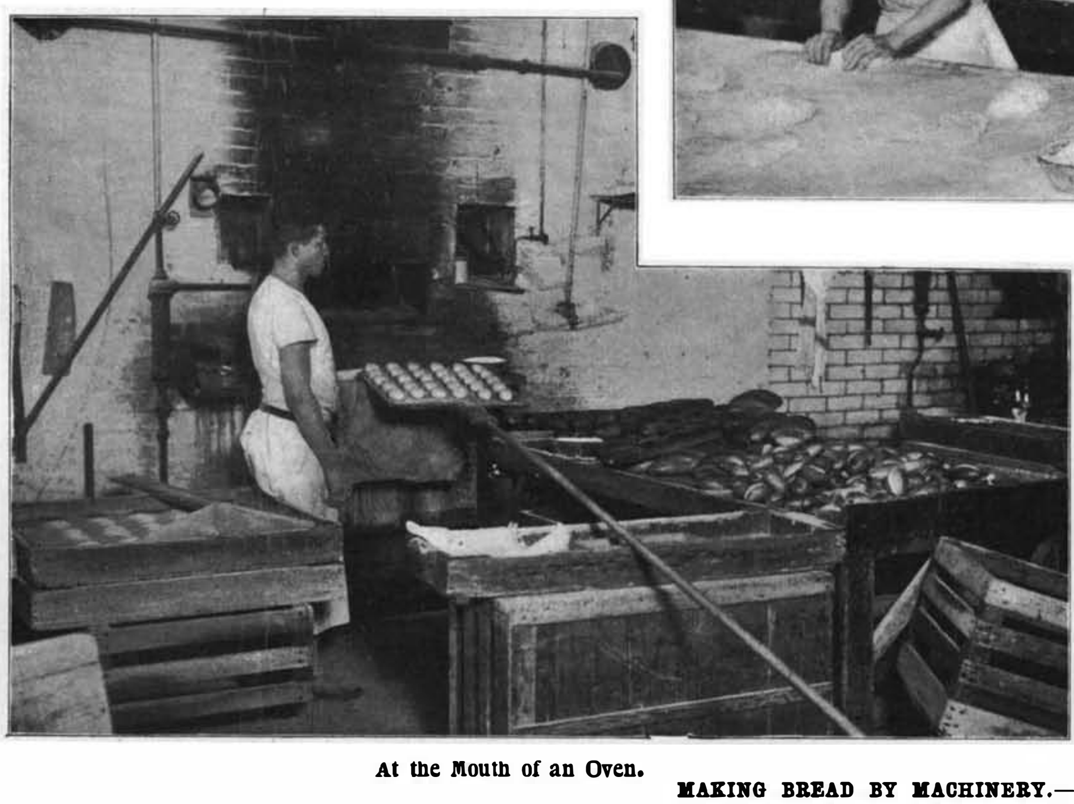
Flour Cleaning and Mixing Apparatus.



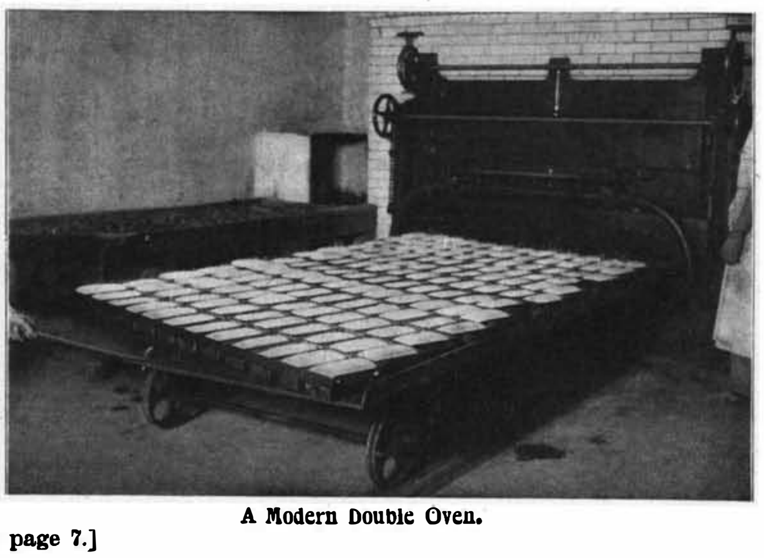
A Mixing-Machine Tilted.



Moulding the Dough into Loaves.



At the Mouth of an Oven.



A Modern Double Oven.

MAKING BREAD BY MACHINERY.—[See page 7.]