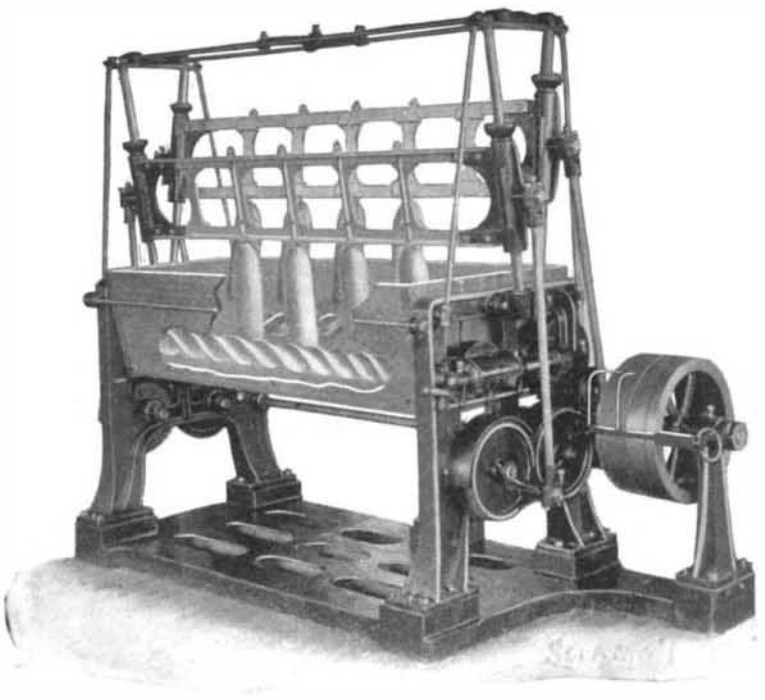
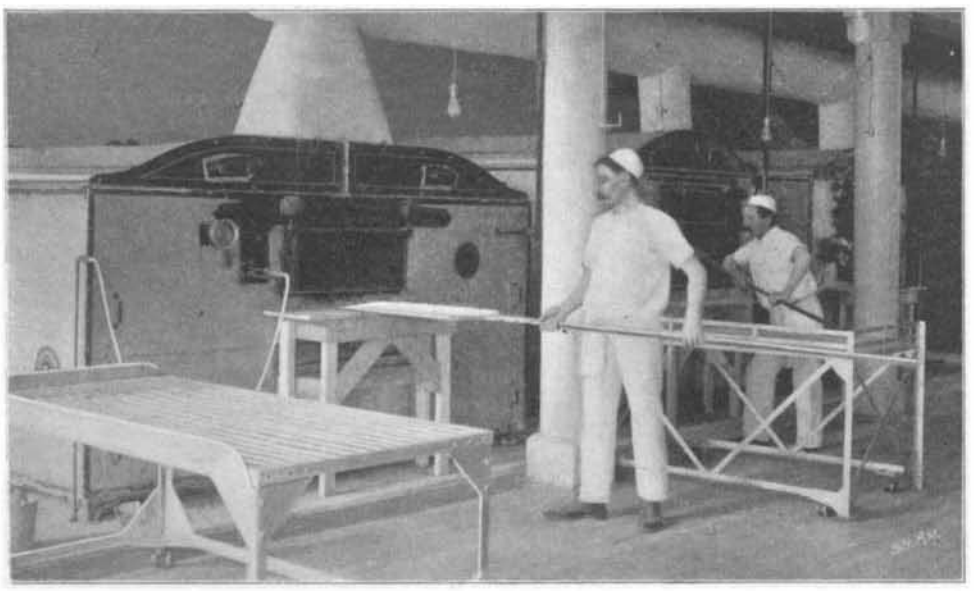
President Loubet; General Brugère, Commander-in-Chief of the French Army, Vice-President of the Supreme Council of War and Inspector-General; General de Chalendar, Commander of the 14th Infantry Brigade; Lieutenant-Colonel Hermite, Commander of the 6th Battalion of Foot Artillery; Captain of Artillery Peuilloux de Saint Mars, and Captain of Cuirassiers Lasson, attached to the General Staff of the government at Paris. Representing civil life, and previously arrived in the passenger steamer 'Touraine," were the present Count and Countess de Rochambeau; the present Count de Lafayette; M. Croisset, of the Faculty of Letters; M. Le Grave, Commissioner to the Louisiana Purchase Exposition; and other well-known civilians. In appreciation of the courtesy of the French government Secretary Moody assigned a special squadron from the United States Navy to meet and salute the incoming "Gaulois" and act as an escort of honor. This squadron consisted of the cruiser "Olympia," Rear-Admiral Higginson's flag-ship, and the battleships "Kearsarge" and "Alabama."

The ceremonies at the unveiling of the statue in Lafayette Square included the following programme: Invocation by Dr. Stafford; welcome by the President of the United States; unveiling of the statue by the Countess Rochambeau; music, "The Marseillaise," by the French Band; presentation of the sculptor, M. Hamar; remarks by the French Ambassador (in French); selection by the French Band; remarks by General Horace Porter, United States Ambassador to France; selection by the Marine Band; address by Senator Lodge; "Star-Spangled Banner," by the French Band; remarks by General Brugère; benediction by Bishop Satterlee.

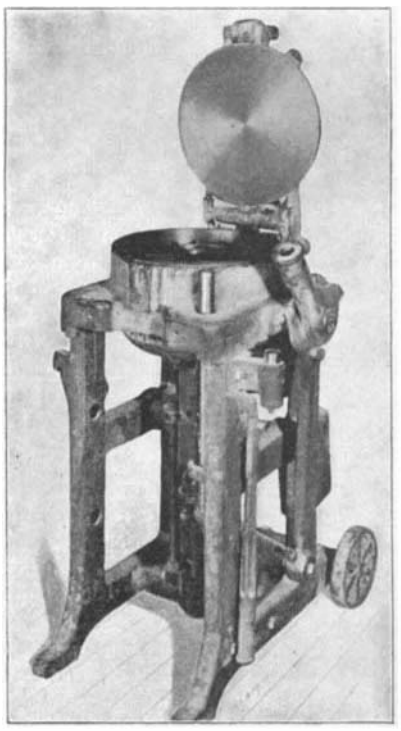
Following the ceremonies of the unveiling, social functions in entertainment of the guests will follow as a pleasant ending of the celebration. It is understood that the guests will visit various points of interest in the United States before returning to their native land.



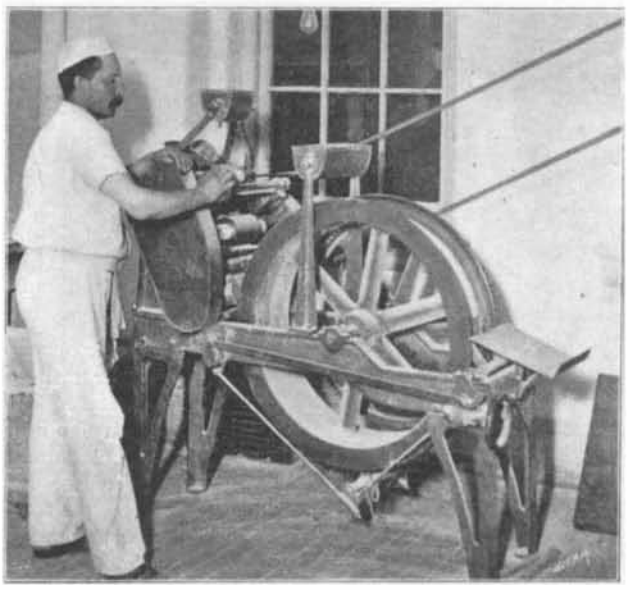
A Kneading Machine, Showing Mechanism.



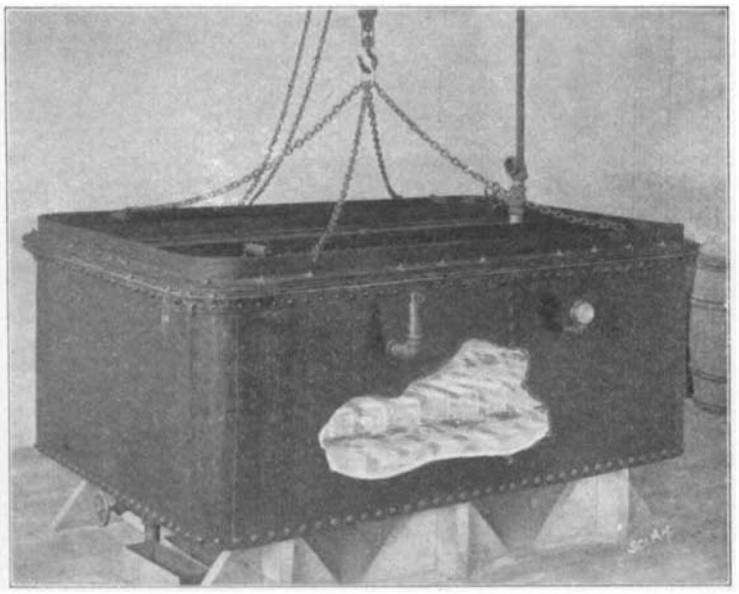
In the Baking-Room.



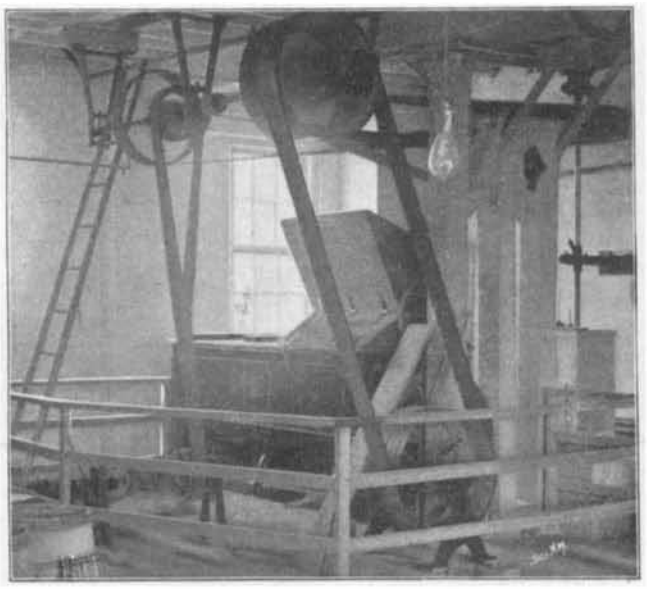
The Dough-Divider.



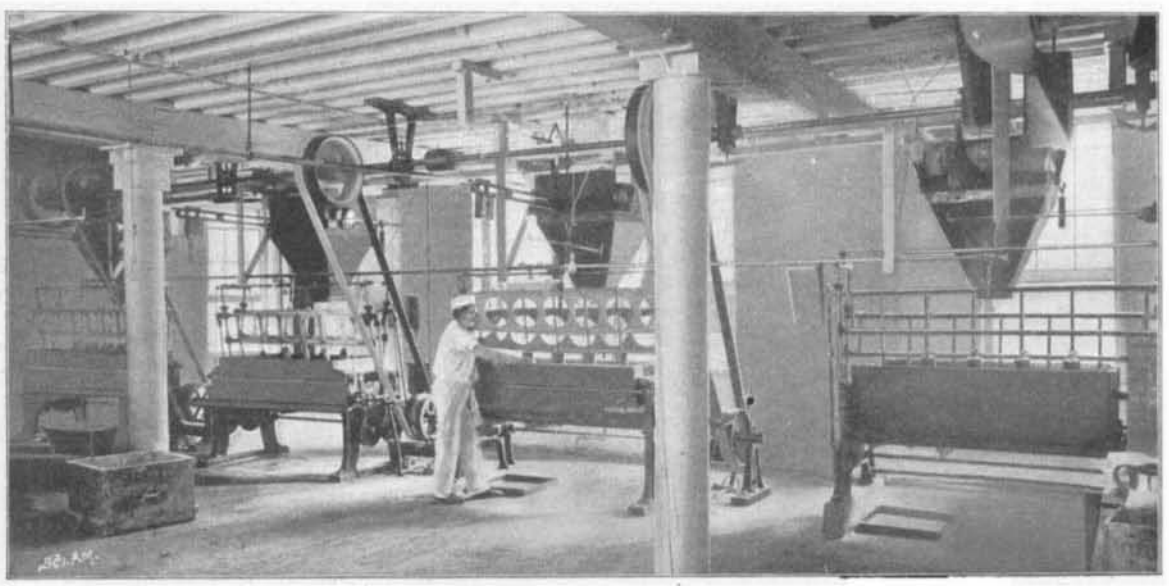
A Machine That Forms Dough Into Loaves



Crustless Bread Oven.



Flour Mixer and Cleaner.



Machines For Mixing and Kneading the Dough.

HYGIENIC MECHANICAL BREAD-MAKING.

The man who insists upon eating only the bread that his mother makes probably considers the loaf offered for sale in the grocery stores of the large cities the product of an uncleanly factory, and of the unwashed hands of men reeking with perspiration. Possibly that may have been true some ten years ago; probably it is still true of the little cellar bakery which supplies the bread of the people who live in the poor quarters of a large city such as New York. But home-made bread, good though it may be, has now been almost supplanted by the bread kneaded and baked by modern apparatus, especially designed for its purpose. Furthermore, machine-made bread has the one great merit over its domestic rival that it is absolutely uniform in quality. Each loaf is exactly like its fellow. The ingredients are always the same. The dough is always allowed to "raise" at a constant temperature. If in addition to its absolute uniformity, perfect cleanliness of production could be attained, there would be no reason for using home-made bread. It was the pleasure of one of the representatives of the SCIENTIFIC AMERICAN to inspect a plant installed at 362 West Broadway by the National Bread Company, of 25 Broad Street, New York city, in which bread is made by a system not only efficient, but so clean in its methods that it would meet with the approval of the most exacting physician.

Briefly described, the process of making bread at this plant consists in mixing the various brands of flour—made from spring wheat, winter wheat, and pure rye—by means of a mechanical mixer and cleaner; conveying this mingled flour to a huge storage bin; transferring the flour to scales, by which it is automatically weighed and discharged into machines by which it is kneaded into dough with the necessary quantity of water; auto-

matically removing the kneaded dough from the machines and allowing it to raise in a steam-heated room; dividing the dough into sections and molding it into the desired shape; and finally baking the dough into bread. From this brief statement of the essentials of the processes carried out it does not appear that any wonderful efficiency is gained, or that any unusual cleanliness is observed. But a closer examination of the process will throw more light upon these important points.

Every man who works in this plant must be a surgically clean man. Before he starts his day's work he must bathe himself in one of the factory bathrooms; he must discard his own clothing and wear that which is supplied by the company. The clothing thus supplied consists not simply of trousers and jacket, but of a complete suit of underwear, down to a clean pair of socks. Not before he has clothed himself in a clean working suit, spotlessly white, is a man allowed to enter a working room. Surely a system which exacts the utmost cleanliness of its workers should produce a product which can be fearlessly eaten even by the man whose diet in large part consists of the bread that his mother makes.

In the making of this hygienic bread the first step is to mix and clean the flour. These two duties are performed by a machine of most wonderful operation. The machine in question takes the spring and winter flour, mixes them together, and so thoroughly refines them that even the finest fibers of the sack are removed and discharged into a refuse receptacle. Modern milling machinery has done much to improve the quality and cleanliness of flour before it reaches the consumer; but before it can be kneaded into dough and baked into bread it must be still further cleaned. That is why so elaborate a machine is required.

From this mixing and cleaning machine the flour is transferred by screw conveyers to a large storage bin. From the bin a second system of conveyers carries the cleaned flour to automatic scales, by which a certain quantity of flour is automatically weighed and discharged into the kneading and mixing machines. Yeast and other materials and filtered water of a certain temperature are added to the weighed flour in the desired quantities.

By far the most important and interesting feature of this bread-making plant are these kneading and mixing machines. It is their purpose to knead the dough exactly as it is kneaded by human fingers; but human fingers could never knead so thoroughly and so quickly, nor could they produce as many pounds of bread from a barrel of flour as these machines can. The main elements of a kneading machine are a wooden trough, above the bottom of which two screw conveyers are longitudinally mounted; and two reciprocating frames carrying wooden plungers inclined toward each other and arranged to play between the screw conveyers. The frames are connected by rods with two meshing gear wheels driven by a countershaft. The screw conveyers are rotated by the same means. The operation of such a machine is a rare sight. The screw conveyers, rotating in opposite directions, force the dough to the center of the trough; the oppositely rotating gears, through the medium of the connecting rods, cause the plunger frames to move up and down alternately, and the wooden plungers as they rise and fall intermingle the particles of gluten forced toward them by the conveyers. After thirty minutes of mixing and kneading, by which the flour, water, yeast, etc., are intimately commingled into a perfectly homogeneous mass, a trap door in the lower part of the machine is opened and the dough is automatically transferred to a wooden trough. It is conveyed to the steam-heated raising room. The trap door is then closed, new materials are put in the machine and another lot of dough is mixed and kneaded. There was once a time when all this kneading and mixing was done by hand. Not only is it hard to knead dough manually, but the flour is not economically used. By using mechanical kneaders, the dough can be mixed and thoroughly kneaded without touching it with the hands. The ordinary mechanical mixer produces about 285 pounds of bread from a barrel of flour. That is undoubtedly a very good result. But the peculiar kneader which we have described does better. Its average production is 350 to 352 pounds of bread per barrel of flour. Its record is 388 pounds. This economy and efficiency is due entirely to the peculiar kneading of the dough. The ordinary mechanical mixer usually effects a mixing of the flour, water, yeast, etc., by means of a double spiral dasher. There is no attempt to reproduce mechanically the kneading action of the fingers. In the machine under discussion, the kneading parts are mechanical facsimiles of the housewife's fingers.

After the dough has fermented or "raised," as it is popularly called, in the steam-heated room previously referred to, it is ready for the molder. Unfortunately no machine has ever been invented which is capable of giving to the dough any desired form. For that reason it is necessary to employ, even in this factory, men whose duty it is to mold the dough into the proper shape. But, despite this necessity, an attempt has been made to introduce a mechanical former. This machine consists simply of a number of rolls by which the dough is taken and curled and curled until it is discharged in the shape of a rather long cylindrical loaf. The machine does its work well. In the future we may even hope to see similar machines which will produce the usual cottage and twist loaves, as well as the other forms.

From the kneading and mixing room the fermented dough is dropped through chutes to the molding tables on the floor below. There the men divide it into small parts, and deftly knead it into the form in which it is to be baked. For some kinds of bread it is necessary to cut the dough into a number of very small parts. For this purpose a very ingenious divider is employed, which consists of a plate through which knives may pass vertically. The dough is laid upon the plate; a cover is swung down; a lever is pulled; the knives rise and the dough is cut into thirty-six parts. No matter what the quantity of dough may be, the number of parts into which it is cut will always be thirty-six. Moreover, the division is so clean that none of the parts cling to each other.

After having been molded into loaves the dough is allowed to raise for a short time, and it is then ready for the baking ovens. In the plant under consideration the design of the ovens conforms in purpose with the apparatus used in other parts of the plant. The comfort of the bakers and cleanliness of the bread are the main ends which it has been sought to attain. The old baking ovens are fired from the front. Coal is shoveled into a firebox which is placed directly beneath the baking tiers. Ashes are removed through the same opening. Naturally such a system presents a most excellent opportunity for the mingling of cinders with the dough. Such an objection has been overcome in the National bread plant by firing the ovens not from the front, but from the back. It therefore follows that the men can work at their ease, and that there is little or no possibility of baking bread in which a goodly portion of coal dust has been mingled. In order that the baker may see how his bread is baking, electric incandescent lights are used, which illuminate the interior of the oven. In order that a wonderfully tempting nut-brown color may be produced, steam is introduced into the oven during the baking process. After the baking the loaves are removed from the oven by means of long wooden shovels called "peels." They are then collected, classified as it were, sent to the shipping room, wrapped in paraffine paper and then loaded on delivery wagons.

In concluding this article attention should be called to an apparatus the like of which is probably not to be found in any other bread-making plant. The apparatus in question is intended for the baking of Boston brown bread and of crustless bread. It is a rather fashionable practice in serving sandwiches to cut the pieces of bread in triangular form and to trim off the crust. No doubt very dainty sandwiches are thus made. But the loss of good bread is considerable. In order to prevent this loss the National Bread Company has devised a steam oven in which bread which is absolutely without crust is produced. The dough is prepared in the usual manner, and is not baked by direct exposure to the intense heat of a fire, but is steam heated in a completely closed tin box. The steam from which the necessary heat is derived is the exhaust steam of the plant. The heat thus generated may be therefore said to cost practically nothing. And the result of this peculiar steam-baked dough is a bread which is a unique product of the modern baker. The same process is used in the baking of Boston brown bread. The dough is merely inclosed in cans and subjected to the baking heat of this exhaust steam. That crustless bread oven and the kneading machine may well be considered as two of the most interesting mechanical contrivances of this hygienic bread-making plant.

The company has under construction a scaling machine by means of which the dough can be cut into pieces of identical weight, each piece being sufficient for one loaf. It is expected that this machine will be ready for the bakery within a few weeks. When it is installed the entire operations from cleaning of the flour to the baking of the bread will be practically automatic, so that the human hand will not come in contact with the flour, dough or bread at any stage of the manufacture.

Trials of the Submarine Boat "Adder."

The submarine boat "Adder" had her trial trip on May 18. The trial is particularly noteworthy for the fact that it is the first time that a submarine boat has been operated in fresh water. The longest of the "Adder's" submerged runs was about 1½ miles; several of them were fully a mile long. In order to show that the vessel could be as easily handled in fresh as in salt water, a number of short or porpoise dives were made.

Engineering Notes.

According to the Railway and Locomotive Engineer, the first charter ever granted in this country, or probably any other, for the building of a railroad, bears date 1819. The Pennsylvania Legislature granted the charter in question to Henry Drinker, for a railroad from Delaware Valley to the headwaters of the Lehigh River—practically the route now controlled by the D., L. & W. Railway from the Water Gap to Scranton. That was before the days of steam, and the "wagons" that were to be run on the road were simply horse vehicles. The old charter, and the rights it conveyed, were purchased by the original Delaware & Lackawanna Company for $1,000.

There is every reason to believe that the great rush of German iron and steel not only into British and continental markets, but even into America, is prompted by financial necessities, remarks the Glasgow Herald. The country is suffering from the effects of enormous and unhealthy overgrowth. Production has been lately reduced by the force of circumstances, as the number of unemployed reveals, but it is still in excess of normal requirements. The surplus is still evidently so great that the only conclusion one can come to is that many concerns are being run merely for the purpose of "raising the wind." It is certain that most of the reported transactions in German iron and steel in foreign markets must be made at a heavy loss on the cost of production. For instance, a sale reported a day or two ago of 30,000 tons of hematite pig iron for America at 55s. f. o. b. Rotterdam is at a price 2s. per ton under Cumberland hematite. Yet the German stuff, made from imported ore, doubtless has to be brought some hundreds of miles from the furnaces to the port of shipment. Coal has lately been taken from Scotland to Stettin, there to smelt iron which was brought back to Scotland. All this means a losing business.

The locomotive industry of Austria comprises five different establishments, employing 5,200 workmen, viz.: The machine works at Florisdorf, with 1,300 men; the machine shops of the State Railway Company at Vienna, with 1,300 men; the locomotive works at Wienerenstadt, with 1,400 men; the Kraus Machine Factory at Vienna, with from 400 to 500 men; and the Bohemian-Moravian Locomotive Works at Prague, with 800 men, says The Railroad Gazette. The total number of men employed in normal times is about 6,000. The total annual capacity of the five establishments is about 400 locomotives, and their annual earnings are between $4,060,000 and $5,075,000. The various establishments have at present orders for 92 locomotives and 24 tenders from the State, and for some 20 locomotives from railroad corporations doing business in Austria. Foreign orders were quite frequent in former years, and even as late as 1900 no less than 60 Austrian-built machines went to Belgium and France. During the present year, however, the only foreign order received has been one from Egypt for six locomotives. Unless new contracts are obtained in the near future, four of the five locomotive-building establishments will be without work within six months. In fact, the blacksmiths and turners will be left idle much sooner.

The accumulation of amalgam on copper plates, like other mill matters, is largely resultant from the ore treated. In the case of some sulphide ores the amalgam has a tendency to form hard scale on the plates, which cannot be removed with a rubber scraper, whisk broom or any such tool, says the Mining and Scientific Press. But with a steel scraper the scale can be broken through and cracked off like a layer of dry putty, and this, if done properly, leaves the plate with a soft and satiny amalgam surface, if anything, better for catching gold, than the uneven surface of harder-scaled amalgam. The use of the steel scraper is necessary with inside plates, where the scouring of the heavy mineralized pulp seems to harden all the amalgam. Amalgam which forms hard scale on the plates yields bullion finer in gold and lower in silver than the softer variety, and it is generally obtained from ores carrying comparatively coarse or flaky gold. Possibly only the coarser gold tends to form hard amalgam scale on copper plates, so that while in some ore the native silver is the coarser, in other instances, where native silver is almost unknown, scale can only form from ores carrying coarse gold. The increasing proportion of silver to gold in the amalgam caught farthest from the battery is of common occurrence. The old plates should be thoroughly scoured for several hours with sharp sand from the tailings, hot water and quicksilver. The loosened amalgam could then be removed (after washing off the sand with hot water) with a rubber scraper in the ordinary way, leaving the plate with a good, soft surface of amalgam, in excellent condition for further use. Considerable difference lies in the mode of cleaning the plates, and especially in the use of the steel scraper. This tool can be used so as to ruin any plate, but in proper hands it is indispensable to the millman.