

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. LI.—No. 9.
[NEW SERIES.]

NEW YORK, AUGUST 30, 1884.

ENGINEERING DEPARTMENT
\$2.00 per Annum.
[POSTAGE PREPAID.]

FOURTEEN TON LOCOMOTIVE CRANE.

The crane here illustrated is representative of a class of portable steam cranes specially designed and constructed in various sizes for use in steel works. The work to be performed is constant and heavy, night and day, such as ordinary cranes could not cope with. Every part is extra strong, and easily accessible for inspection, while compactness is a prominent feature. In order to be universally available through the works, they travel on the standard railway gauge, and have sufficient stability to lift, slew, and travel with their full load suspended in any position. The engraving is from the *Engineer*, and made from a photograph of the makers' No. 6 standard size, which lifts 14 tons at 12 feet radius, or 12 tons at 14 feet radius. It is the fifth crane supplied to Messrs. Beardmore, of Parkhead Steel Works, Glasgow, but it is the largest yet made capable of slewing and traveling with its full load on ordinary gauge. These

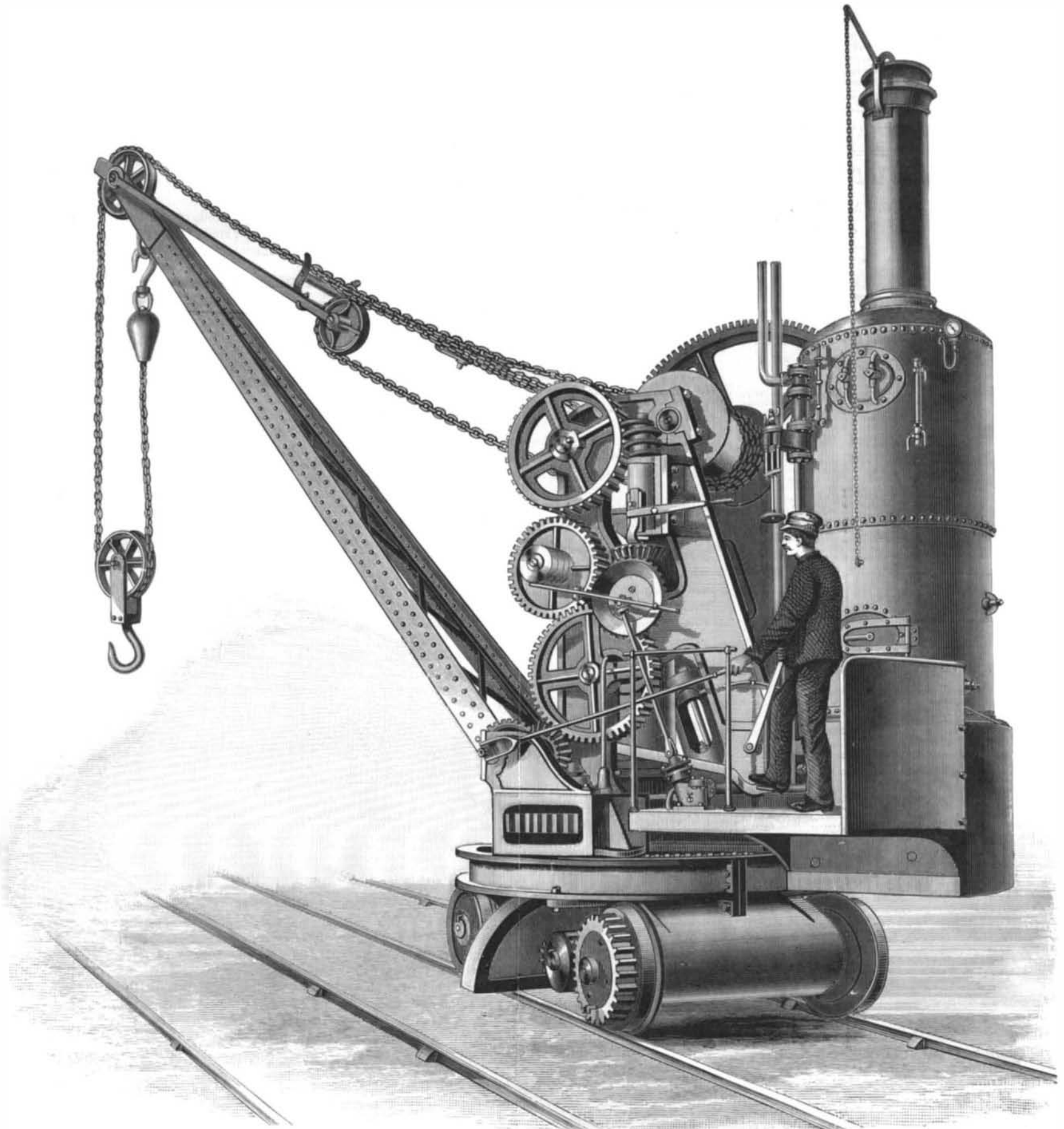
cranes are now in use in the principal steel works in England, and several have gone also to America and the Continent.

The carriage is a massive casting of 10 tons, with a fore and aft wheel base of 8 feet center to center. The wheels with steel tires are for a gauge of 4 feet 8½ inches. The axles are of steel, 6 inches diameter, in brass bearings. The traveling gear, wheels, and pinions are of cast steel, and all outside. On each side of the carriage is a strong wing bracket, giving a width over all of about 7 feet, so that a guide rail or bar could be laid parallel to the rails on which the crane travels on each side, in special positions, when the maximum weights may require to be lifted. This is an extra precaution to provide for any jerk or abnormal strain tending to overcome the stability of the machine. These side rails or bars being half an inch under the brackets, would only come in contact when too great strain was put

on the crane, and in case of a jerk the crane would immediately settle back on the traveling rails.

One of the special features of this crane is the construction of the central post and its connections. The post with its bearings is the most important detail in such cranes. Messrs. Russell have abandoned the use of the roller path so universally adopted in cranes by other makers; holding that when such cranes are exposed to dust and grit the wear is excessive. If the crane is used so that only a part of a revolution in slewing is performed, that portion of the path wears the remaining portion below the level, so that through time the crane ceases to be able to make a complete revolution. If the roller path and sole plate are cast together, the casting requires occasional returning and even renewal, which is inconvenient.

The small engraving shows an improved arrangement of
(Continued on page 132.)



IMPROVED FOURTEEN TON LOCOMOTIVE CRANE.

The Excavation of a Great Cut in France.

The railroad from Saumur to Chateau-du-Loir, after leaving the valley of Loire, crosses an elevated plateau by a cut 1,640 feet long and with a maximum depth of 62½ feet; the cubic contents equaled 274,500 cubic yards.

The material belongs to the Tertiary period, the Eocene; it is made up of a bed of clay inclosing large bowlders of a pudding stone formation, lying in distinct strata, about 17 feet thick; under this is a bed of white clay, 29½ feet thick, traversed by small veins of sand; beneath this again is sand.

The method of removal adopted was as follows: A gallery or tunnel was driven into the cut at its base, and this tunnel was connected at intervals with the surface of the cut by vertical shafts located on the axis of the cut. These wells were then enlarged from the top by giving them a funnel shape, and the material thrown directly into the cars placed beneath, at the bottom of the shaft. The tunnel was driven from both sides.

The tunnel was timbered as in a mine; two posts and a cap of oak 10x10 inches, spaced about 5 feet apart, with lagging of poplar planks 10x1½ inches and 6½ feet long. The gallery was 7⅞ feet high and 11½ feet wide in the clear.

While the tunnels were being driven, the wells were also sunk. At the bottom of the wells the caps of the tunnel-timbering were tied together longitudinally by braces spaced 3½ feet apart, thus forming a kind of box and strengthening the upper part of the gallery; four of the covering planks covered this space.

As soon as the wells were finished and the tunnel driven, the removal of the material commenced. The workmen began by breaking away the earth at the top of the shaft by bars and throwing it into the opening. As soon as the slope of the cone thus formed became too flat to permit the free motion of the debris, the cone was deepened so as to present a steeper pitch. One man in the gallery was all that was required to regulate the fall of the earth into the cars. At this cut only two wells were worked at a time; this was sufficient to furnish a cube of 600 cubic yards daily. By this method timber was saved, and the tunnel advanced by reusing that from the portion of the cut finished.

The train of empty wagons was drawn in by three horses, and the horses and their driver were prisoners in the tunnel heading while the filling was going on, but as no relays of horses were thus required, an interval of rest was afforded. The loaded cars descended by gravity to the dump by reason of the grade of the road.

In this method of excavating, it is advantageous to have cars as large as possible so that they may be less frequently moved; at the cut in question the cars contained 4¾ cubic yards and ran upon a track of 5 feet gauge. As each movement of a car corresponds to a stoppage in the excavation, as soon as the bed of sand was reached the engineer, to avoid the loss of time from this cause, put a stop valve at the bottom of the well.

The valve was made by placing upon a timber framework a sheet iron cylinder 2 feet in diameter, closed at the bottom by an iron door, like that used on a beton mixer. This door moved horizontally in guides, and was pivoted at one side.

When the successive funnels met at the top, a series of cone-like excavations of great width were presented, and it only remained then to cut down and remove the walls of earth lying between the cones.

The cost of the timber for 1,200 feet of tunnel, including the timbering of the shafts, was \$782,

The manual labor and expense of driving the tunnel amounted to \$1.83 per lin. foot. The total expense was as follows:

Timber for tunnel and shafts.....	\$782.00
Labor and tunnel advance, @ \$1.83x1200.....	2,196.00
Sinking 4 wells at \$20 (100 frs.) each.....	80.00
	\$3,058.00

Dividing the total cost by the contents of the cut, 274,500 cubic yards, we have as the cost per cubic yard about 1-1 cents (0.074 fr. per cubic meter).—*Genie Civil; Engineering News.*

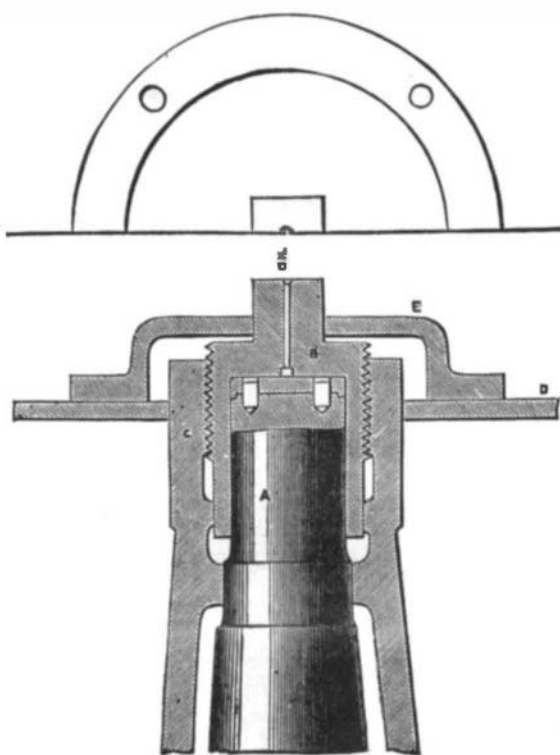
Painting Shingled Roofs.

More shingle roofs are painted now than ever before in the history of building in this country. It is mostly seen in cities and suburban towns, although in the country it is by no means rare. Considerable inquiry has led to the conclusion that many have their roofs painted to add to their appearance, which in many cases it certainly does, while others labor under the impression that the paint acts as a preservative to the shingles. The latter are probably right, provided the paint is renewed as often as it needs to be. If the roof is allowed to remain with the paint partly worn off the shingles will retain more moisture, and consequently decay sooner than they would were they not painted at all. On the score of durability, however, little can be gained in cost by painting. A good shingle roof unpainted will last a great many years, and the expense of painting it a few times would replace it. One painter, who had painted the roof of his own house, when questioned by a representative of the *Lumberman*, used good logic from his standpoint. He thought that painting a roof would add somewhat to its length of life. "You see," he said, "that I have painted mine. I do for myself what I desire to do for others. If I did not, the influence would be bad."

FOURTEEN TON LOCOMOTIVE CRANE.

(Continued from first page.)

post and bearings. The post is a wrought iron forging, A, fixed in the carriage, with a bearing at top and bottom, on which the crane revolves. The weight is carried on a steel plate fixed on top and the steel bush, B. This bush is screwed into a jacket or case, C, which is continued down to the bottom bearing. The post is thus entirely inclosed, and no dust or grit can find access to the bearings. There is a square head on the bush, to which is fitted a large cap, E, fixed by four bolts to the cross girder, D, which is a wrought iron plate. The bush can be adjusted by screwing it in the case to maintain the crane at a constant level above the carriage, taking up any wear. It can also be removed and replaced for inspection or cleaning in a few minutes. On unscrewing the bush the crane settles down about a quarter of an inch lower than the working level, and rests on the carriage till the bush is replaced. The side frames are of massive proportions, with brass bushes and covers for the various bearings of the shafts. There is a large balance weight of 8 tons under the boiler, with ash space and self-discharging arrangement. The boiler has two cross tubes in the fire box, and is double riveted in the vertical landings. A capacious tank is carried on the opposite side to the platform. The engines have a pair of 8 inch cylinders, with link reversing motion of steel. The crank shaft is balanced by weights to prevent vibration. The disengaging



CRANE POST AND BEARINGS.

clutch for hoisting is in the view of the driver on the platform, and there is a powerful foot brake for lowering.

The jib is 22 feet 6 inches long, of wrought iron, with lattice stays, and is adjustable by worm and wheel motion. The handles are all convenient to the driver, who has easy control of all motions, viz., hoisting, lowering, slewing, traveling, and adjusting radius. The weight of the crane is 41 tons, exclusive of water in the boiler or tank; the center of gravity of the whole is as even as possible to obtain maximum stability. The greatest radial projection at the back is 7 feet 9 inches.

Saccharification of Different Starches.

In spite of all that has been written and said concerning the saccharification of the different starches since brewers have been allowed to use unmalted grain in their mash tuns, there is still, says the *Brewers' Guardian*, much difference of opinion, and the practical applications of theoretical opinions have not always been attended with success. In dealing with the conversion of starch into sugar, the fact has frequently been overlooked that starches vary very considerably; the starch of barley is in many respects different from the starch of maize, and the starch of rice differs from both; this difference is not in the chemical composition, for all the starches are identical in this respect, but in their physical properties; the size and aggregation of the different starch cells have a most important bearing on the problem which has engaged so much of the attention of brewers of late. From the following table it will be seen how greatly the cells of the starches vary in size; the dimensions are given in decimals of an inch.

Potato.....	0.00270 to 0.00148
Maize.....	about 0.00074
Dari.....	0.00074
Wheat.....	0.00185 to 0.00009
Barley.....	about 0.00073
Oat.....	0.00087
Rice.....	0.00020 to 0.00002

It will thus be seen that the sizes of starch cells vary between very wide limits, and it has been established by some experiments of Symons and others that the smaller sized starches resist the action of moist heat much more than the larger ones; the cells of potato starch, for instance, tumefy and burst at a temperature several degrees below those of rice starch; this question of the tumefaction of starches has

a very important bearing on their saccharification, and scarcely sufficient attention has yet been paid to the subject. The larger the starch cells, the more compact and dense are their cell walls, and thus the greater is the resistance to the disintegrating influence of heat; diastase, also, has comparatively little action on the outside of the starch cells; the cells must be burst or broken, so that the diastase can penetrate into the interior for this agent to exert its full saccharifying action. If this view be correct, the difficulty of conversion of the starches must be in direct proportion to the sizes of the cells, and the experience of practical men will probably confirm this, for although rice is a brewing material which presents many advantages as regards price and purity, it is not saccharified with the same ease as maize or potato starch, unless previously submitted to some treatment by which its starch cells are ruptured. Before the solution of this problem can be satisfactorily effected, the physical as well as the chemical properties of starch must be taken into consideration, and it is in this direction that further investigation is needed.

Gerome Cheese.

The following is a description of the manufacture of a very popular cheese, known in France under the name of Gerome. It is largely consumed in Paris just as it is ripe, and it would be difficult to mention any cheese which is more delicious at this particular period. It is a soft round cheese, varying in weight from 4 pounds to 8 pounds, and is sometimes made with the addition of aniseed. It is made with milk at the temperature at which it comes from the cow, this being placed in a deep copper vat holding some forty-five quarts, when it is covered with a wooden lid, in the center of which is inserted a wooden funnel resembling in form a cup. To the bottom of this is attached a cloth for straining. When this is not used, a small disk is drawn over the hole. The rennet is immediately added, in quantity according to the weather and its strength.

In half an hour the whey is divided from the curd with a ladle, and the vat recovered. In another half hour the separation is continued, with the aid of a copper strainer, 12 inches by 4 inches. When the curd is divided into pieces about the size of a small nut, it is taken out and placed in wooden cylindrical moulds, from 5 inches to 9 inches in diameter. Two moulds are used for each cheese, the one being fixed into the other, which is somewhat larger in diameter, and has a number of holes pierced in the bottom. The total height of the two when fixed is from 14 inches to 16 inches. The curd entirely drains in this mould, and at the end of about twelve hours it will have sunk to about the height of the bottom and larger part of it, so that the top part can be taken off. The cheese is then placed in another mould of the same diameter as the bottom one, and put upon a shelf upside down. After six hours it is again turned, and this turning is continued twice daily for the two following days.

In draining the whey the moulds are placed upon sloping shelves, which are furnished with a rim at the edge, as in the Camembert cheese rooms in Normandy. The whey runs off, and is collected in a receptacle placed at the side of the table for the purpose. The temperature of the room in which this operation takes place should be from 59° to 64° Fah. The next thing to be done is to salt the cheeses, which for this purpose are placed upon small boards made of beech, and upon which layers of fine salt are sprinkled. The surface of the cheese must be well salted, and the operation repeated every three or four days, care being taken that it is turned each time. This turning is continued twice daily for three days after salting, and the surfaces of the cheeses each time are gently moistened with tepid water. When sufficiently dry on the crust they are removed to the drying room, 30 grammes of salt having been used in the salting process. In this *sechoir*, or drying room, the cheese shelves are built one above the other, so that large numbers of cheeses can be kept in a small space and well cured, provided the temperature and aeration are complete. In summer the process of ripening is frequently conducted in the open air, the cheeses being protected with cloths to keep off flies and the sun; but during the other parts of the year a specially prepared room is invariably used.

When thoroughly dry they are removed to the cave or cellar for the completion of the process, and here they are very carefully managed. This cave must be in good condition, with a draught of air passing through it; but if the temperature is too low, the cheeses crack and lose quality. The time they remain here is determined by the season and the size of the cheese, the maker judging this for himself. The largest, however, are usually kept from three to four months. While in this compartment they are often turned, and washed with tepid water slightly salted, and daily examined to see whether they are ripening too rapidly. When they are brick-red in appearance and the surface sufficiently firm to yield to the pressure of the finger, they are ready for market. A good Gerome is firm on the exterior, rich, and oily, and has a few small holes in the interior; while inferior makes, like inferior Gruyere, have numbers of large holes, are fragile, easily crumble, and sometimes become soft and pulpy when the whey has not been properly extracted from them.—*London Grocer.*

Platinized Magnesium.

M. BALLO.—Magnesium, which has no action upon pure water, decomposes it instantly in presence of a trace of platinum chloride.—*Zeit. f. Anal. Chem.*