

BRICK MAKING.

Perhaps there is no process so easy to describe and yet so hard to execute as the making of brick. The clay is dug, kneaded, moulded, and burned, and each detail appears so simple that it would seem any one ought to be able to transform a little clay into a good brick; but between the pit and kiln stand two characteristics which must be present in order to insure good results—these are experience and skill. No rule can be laid down for the handling of the clay; the routine which in one yard produces first quality would, if transferred without change to another, only cause miserable failure. The method of burning and the degree of heat which in one locality will turn the clay there found into good, hard brick would, in the next yard perhaps, yield only a kiln of spoiled and useless clay. So that it is safe to say that a brickmaker who had only worked one clay in one yard would be compelled to begin anew his apprenticeship if he were thrown in contact with different features.

The quality of a brick can only be ascertained after we know the exact conditions under which it is to be used, for the simple reason that a brick may do well in one place and yet be useless in another. Of course, a first-class hard-burned brick—in this neighborhood, those of a dull, dark red are preferred—will do in any locality; but in some circumstances the work is not harmed, and the cost is reduced, by the judicious use of other kinds. A hard brick which may be saturated

is mixed from one to a little over one bushel of coal dust or screenings. Until recent years, wood alone was used in the burning of brick, which was a slow and, as wood became scarce, an expensive operation. The mixing of fine coal with the clay reduces the time of burning to from three to four days, lessens the cost, and insures a more equal and thorough burning of the entire kiln.

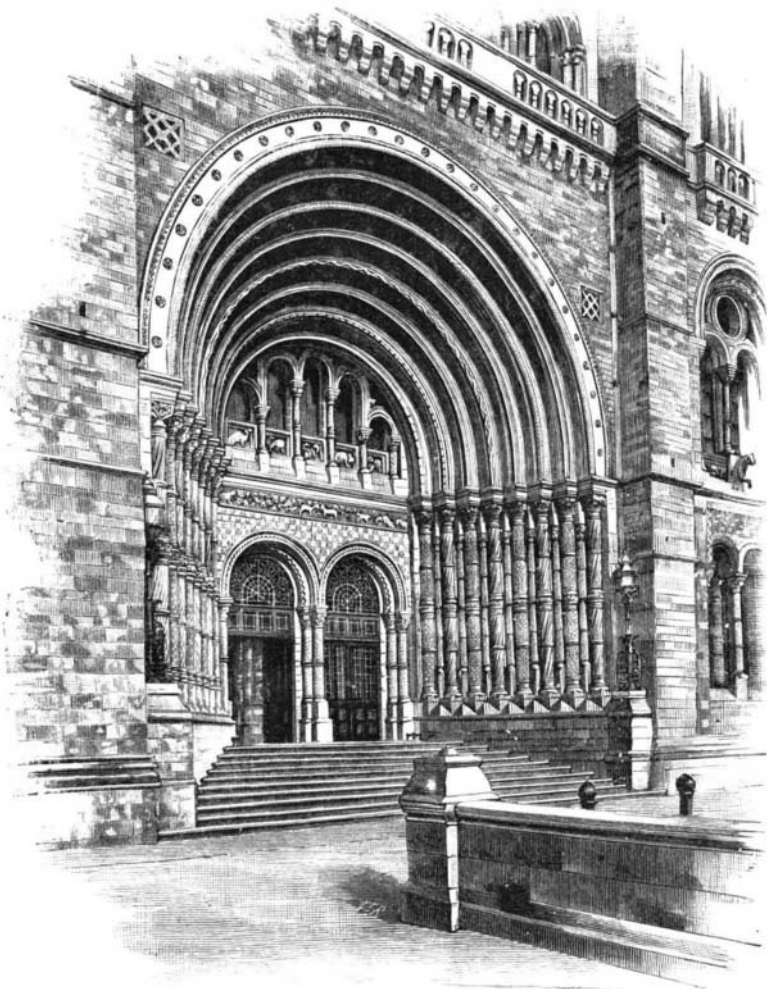
From the tempering pit the clay passes to the grinder, placed just at the edge of the yard. There is a vertically placed box, in which revolves a shaft carrying blades which force the wet clay down and through an opening in the bottom of one of the sides. The mould, which is a frame having spaces the size of the brick, is first sanded and then placed on a platform beneath the opening, when the clay is forced into each space by a descending plunger operated by a short crank on a shaft driven by the main shaft of the grinder. A forward movement of a lever by the moulder draws the filled mould forward, when it is placed on a platform barrow. When full, the barrow is rapidly run to the yard and the moulds emptied, the brick lying flat upon the ground. When partially dried by the sun, they are turned on edge by an edging machine, which resembles the mould in shape, but is not quite so deep. As the bricks leave the mould, their edges are apt to be rough and slightly drawn out or feathered. This is removed by spitting with a light board, of such size as to cover a mould of bricks, attached to the center of one surface of which is a long handle. Where there is plenty of room, the bricks are left in the yard until ready for the kiln. In smaller yards

these cells. The bricks from the center are the most valuable, and are most sought after by builders, although the others, especially the salmon, have their uses, as was explained in the beginning.

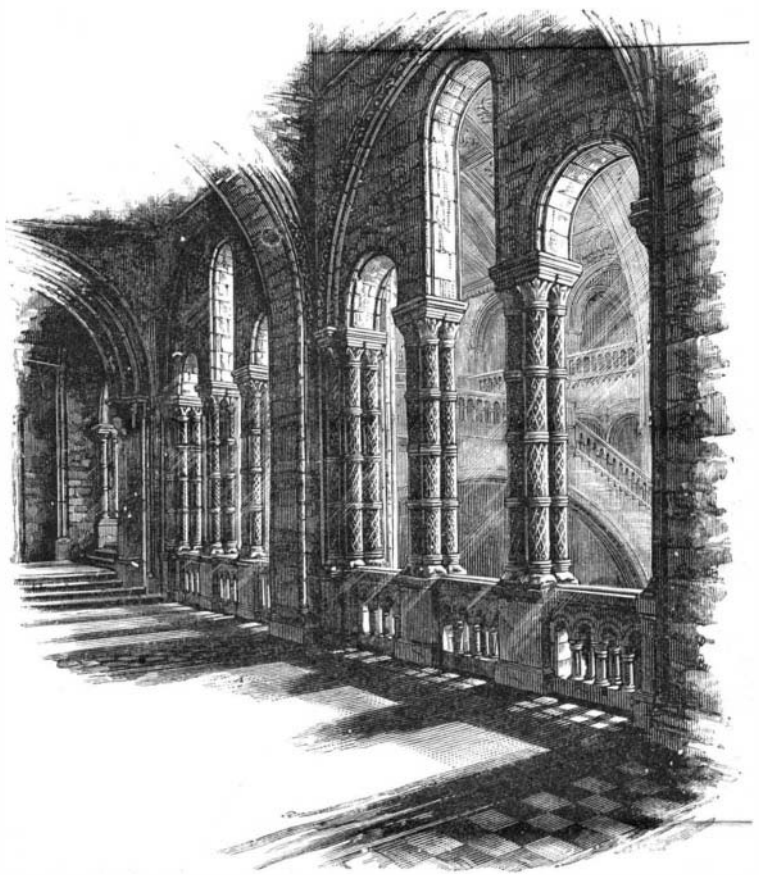
Before the clay can become a brick, it passes, in the most common method of brick making, through the following steps: Digging the clay, shoveling in carts, dumping in the pit, and tempering; shoveling on barrows and wheeling to the grinder; moulding, putting on trucks, carrying to yard and dumping; spitting, turning up, and hacking in the yard; putting on trucks, tossing up in the kiln, setting, tossing out of the kiln, and dumping from the wagon at the place of building. It seems strange that each of a thousand articles can be handled separately so many times and then delivered at a cost of only from six to eight dollars. As one of the oldest and most experienced brick-makers in the country said to the writer: "It is doubtful if any other manufactured article, weighing from four to five pounds, can be handled seventeen different times, moved considerable distances, be subjected to a high temperature for a long time, and be finally delivered, sometimes many miles from the clay bank, at a cost of only a little more than half a penny."

THE SOUTH KENSINGTON MUSEUM.

The great and beautiful building, completed in 1881, for the reception of the overflowing treasures which the British Museum could not conveniently accommodate, has received high commendation for its architectural merits and for its special fitness for the purposes for which it was designed, and is now one of the places which most strangers visiting London make it a point to visit. It contains the



PRINCIPAL ENTRANCE, NATURAL HISTORY MUSEUM, SOUTH KENSINGTON, ENGLAND.



GALLERY AROUND HALLS, SOUTH KENSINGTON MUSEUM.

with water, then frozen, and finally thawed, without showing any signs of being injured may be used almost anywhere. But a softer brick may stand exposure to the weather and yet be disintegrated if exposed to constant moisture underground. Another brick may not be able to endure either moisture or exposure to the weather, and yet may be well suited for inside work, where it will be kept dry. The adaptability of a brick of a certain quality for a certain location can best be determined by the maker, provided he thoroughly understands his business.

A brick yard, as usually laid out, consists of a large and perfectly level piece of ground called the yard, along one side of which are the rough sheds covering the kilns, and along the opposite side of which are the moulding machines, back of and near which are the tempering pits and clay banks.

The clay is first brought to the tempering pit, which is a circular hole sunk three or four feet below the surface of the ground, and from twenty-five to thirty feet in diameter. In the center is a column, pivoted upon the top of which is a long horizontal arm carrying the wheel. This arm is revolved either by horses traveling around the edge of the pit or by steam. The wheel is large enough to rest upon the bottom, and as it rolls around it is gradually moved from the hub to the outside and then back again, so that in its passage the contents of the pit are surely and thoroughly commingled. The clay brought to the pit is mixed with sand, and sometimes with a different clay, this being governed by the quality of the principal clay. In each quantity of clay sufficient to make a thousand bricks

they are put in hack, that is, they are piled up in a long row six or eight bricks high. When there are indications of rain, two boards nailed together along their edges to form a right-angled trough are placed on top, while other boards are rested against the sides of the bricks, which are thus protected from the water.

From here the bricks pass to the kiln, in which they are placed on edge, with the longest dimensions of every alternate row running in the same direction. Between every two bricks there is a small space left for the passage of the heat, which, owing to the alternating arrangement of the rows, is obliged to take a most roundabout road from the arch to the top. The arches extend through the kiln, and in them at each end the wood for the fire is fed. After the bricks have all been set, the outside is covered with a plaster of clay that prevents the escape of heat. The fire in the arches is started gradually and increased in intensity, and continued as long as the experience of the burner dictates. The small particles of coal distributed through the clay assist most materially in producing heat, and render more sure the even burning of the whole kiln.

For convenience, the bricks from a kiln may be placed in three divisions: those subjected to the greatest heat, near the arch, those subjected to the least heat, near the sides and top, and those in between. In the upper bricks—sometimes known as salmon—small particles of unburned coal may be detected; in the middle bricks, only the small cell formed by the coal remains; while the bricks which have been unduly heated are shrunken and glazed sufficiently to close

departments of zoology, geology, mineralogy, and botany of the British Museum, under the style of a Museum of Natural History, and is open to the public free on three days of the week, there being a charge of sixpence on other days.

Some idea of the character of the building may be obtained from the accompanying illustrations, one showing the main entrance and the other a portion of one of the galleries. The principal materials of the building are red brick, buff and gray terra cotta, with greenish gray Cumberland slates and bands of Welsh slate repeating the banding of the terra cotta. The interior, as may be inferred from the portion represented, consists of courts and corridors of graceful proportions, the numerous columns and arches being richly ornamented, a distinctive feature of such ornamentation in panels and arches consisting of representations of many of the varied forms of the organic kingdom. There are many boldly designed animal forms in silhouette along the lines of crests, while in panels under the windows are reptiles and other allied forms in high relief. One of the panels in the entrance hall represents a pair of herons, one of which has just captured a lizard; and a panel on the balustrade has a pair of grouse, with young ones resting in the herbage. The idea of representing, in the decorations, the object for which the structure was erected has been carried out so far as possible in all the details, one enthusiastic critic going so far as to say of the building that "the facade is an open book, whereon are recorded, in a language which all can read and understand, the inexhaustible beauty and

wonder of this world in which we live." Architecturally, the building is not predominantly either classical, Romanesque, or Gothic, but rather a combination of elements of all three styles, with special features and adaptations that do not belong to either. It is a noble structure, and well sustains throughout the high impression always made upon the educated observer entering its magnificent central portal.

East African Drugs.

Of curative drugs, the East African manifests but little knowledge. Near Lake Ugombo, a small, wild aloe, when the green skin has been peeled off, forms an ice cold and healing application to burns; and in the neighborhood of Dar-es-Salaam, a highly aromatic plant, with hairy purple stalks, called *arcizamudi*, is reputed a good native cure for pains in the stomach. The Somalis occasionally eat the local variety of dragon's blood, a resin of acidulous flavor obtained from the *moli* tree (*Dracæna schizantha*). Between Zanzibar and Dar-es-Salaam occurs a creeper with bean like, hairy, S-shaped pods having severe stinging powers; it is about four inches long, of yellowish brown color, and is called *upupu*. The pain yields to cowdung and wood ashes. In the same region, a broad bladed grass, called *mwanga mwitu* enjoys some fame as a styptic.

Arrow poisons come much more prominently within the range of native study, and most tribes use some description of vegetable poison for anointing their spears and arrows. The most important is a species of *Strophanthus*, either *S. hispidus* or *S. kombe*, which will probably prove to be the sole source of this class of poison used on the eastern coast, from Zanzibar to Somali-land, and even far into the interior. The plant is a runner, bearing large, rough ribbed leaves, arranged in clusters of three or four together. Each shoot consists of three branches, of which one bears the seed and the other two the leaves. The flower is yellow, with curiously tailed petals. The seed has the form of a huge military frog button, with lobes nine inches long, and is the direct source of the poison. This, according to St. Vincent Erskine, is called *umtsuli* in Gaza or Southern Mozambique, and is so energetic that men wounded by arrows in the fleshy part of the leg have been known to die within three hours, and with small bucks the poison takes effect before they can run out of sight. He likens the active principle to strychnine.

These facts quite accord with the description given by R. W. Felkin and A. W. Gerrard (*Pharmaceutical Journal*, April 9, 1881, p. 833) of the poison used by the Wanika and Wakamba tribes, west of Mombasa, except that several roots are supposed to contribute to the deadly effect. These authors mention an antidote composed of sundry roots reduced to charcoal, which, however, proved a failure on trial. Careful investigation of the *umtsuli* reveals the fact that it is a powerful cardiac poison, as powerful as digitalin, and more powerful than veratria, when injected under the skin. But it causes only nausea, vomiting, and some weakness when taken by the mouth.

The flesh of animals killed by this poison is eaten by the blacks without ill effects. Probably identical with this is the "poison tree," from the roots of which the natives of Somali-land extract a black and pitchy substance for poisoning their arrows. Perhaps, also, the pitch-like poison obtained from the boiled-down bark of a tree used on the Rufiji River for application to arrows, lances, and even bullets, and the *muavi*, or poisonous decoction of the bark of a tree, employed in the trial by ordeal of the natives of the Nyassa and Zambesi valley, is the same article under another guise.

Indulgence in narcotics appears to be confined to tobacco, which is very commonly grown under cultivation. It is a special product of the Handei district, whence considerable quantities of the sun-dried leaf, beaten into little round flat cakes about two inches in diameter, are sent down to Pangani for export.

The tobacco is coarse and strong, but of fairly good flavor. The Kiswahili use water pipes (*kiko*), made of gourds of various shapes. They swallow the fumes in smoking, and seem to enjoy the paroxysm of coughing which results.—*Jour. Soc. of Arts*.

ACCORDING to a report of the Church Temperance Society, there are in New York, the metropolis of the New World, 10,197 liquor saloons, 447 churches, and 121 public schools.

THE REPAIRING OF TANKS AND RESERVOIRS.

We illustrate in the cuts accompanying this article an excellent method of repairing reservoirs in general and tanks, such as are used for the reception of gas holders. It involves the application of a coffer dam, which may be made of any appropriate shape. One is shown as applied to the treatment of a crack in one of



BOTTOM SECTION OF COFFER DAM AGAINST TANK WALL.

the gas holder tanks of the Consolidated Gas Company of this city. The apparatus was constructed and used at the suggestion and under the superintendence of the engineer of the company, Mr. William T. Lees. To the gas engineer this process offers the complete solution of one of his most vexatious problems.

When such a tank wall breaks, the rupture, as a rule, is vertical, and runs down nearly to the bottom, a distance of 20 to 35 feet. It is usually of sufficient extent only to cause a loss of water, not enough to ex-

haust the tank in spite of all efforts. The general way of mending such is to pump out the water, cut the brick away for a foot or two in width, and rebuild the space. Then the tank is filled again. In many cases, after all this has been done, the crack reopens in about the same place. When the water is pumped out, the walls tend to contract under the external pressure, thus

partially closing the break. Then, after repairing, when water is readmitted, the hydraulic pressure, re-establishing the balance, makes the walls assume their old position, and the crack opens as before. It was with a view of avoiding the shrinkage under compression and subsequent expansion of the walls that the coffer dam was applied. The course of reasoning was this. The water, while present in quantity to fill the tank, was assumed to keep the crack open to its widest extent. This seemed to offer the proper conditions for repairing it. If well stopped under these circumstances, there seemed little or no possibility of its opening again.

The tank in question was about 170 feet in diameter and 70 feet deep. A cast iron coffer dam, of U-shaped section, was constructed in sections, 6 ft. long and 4 ft. 9 in. in width. Flanges, faced off and perforated for bolts, were provided at the top of the lower section and at the top and bottom of the others, for attaching them together. The bottom section was closed at the base, and had a small downward extension or well to facilitate pumping. Stud bolts were provided by which to lift the whole. A semi-circular groove was carried around the edge designed to come against the sides of the tank. A 2 in. India rubber hose, with $\frac{3}{4}$ in. aperture, was provided to act as packing. The dam was applied as described below.

The sections were all screwed together, while lying on the ground, with bolts and nuts, so as to secure watertight joints between them. The hose was placed in the groove, and by blocks and falls the united sections were raised to a vertical position and lowered into the tank. Several of the lugs were used for attachment of the slings, so as to provide against accident. When the dam was in place, having the crack within its opening, the water was pumped out by a large pump. As soon as adhesion to the tank wall was thus secured, a small steam siphon sufficed to keep it dry. Thus a space was obtained nearly 5 ft. long and 15 in. wide, extending some 30 ft. down. A man was sent into the dam, who, with hammer and chisel, calked the crack, driving oakum into it until it seemed perfectly filled. The adhesion between the tank and dam under the influence of the pressure was so great that the weight of the structure (several tons) could be sustained perfectly without tackle.

It was applied in a somewhat contracted space, between the outer section of a gas holder and the tank. Where the corresponding space in other gas holder tanks is insufficient, more room can be procured by hoisting up the outer section.

The mending worked excellently. The anticipated results followed, and the tank is in use to-day.

An incidental advantage of the method is that there is no necessity of stopping the operations of the gas holder, at least as regards its inner section. The flange

on the bottom of the outer section, it may be assumed, would in most cases interfere with the use of that section. The face of the dam was flat. The radius of curvature of the tank was so large that no corresponding shape of the face of the dam was necessary, the elastic hose accommodating itself perfectly to the slight bend requisite. The application of this method to reservoirs in general is so obvious as to need no mention.

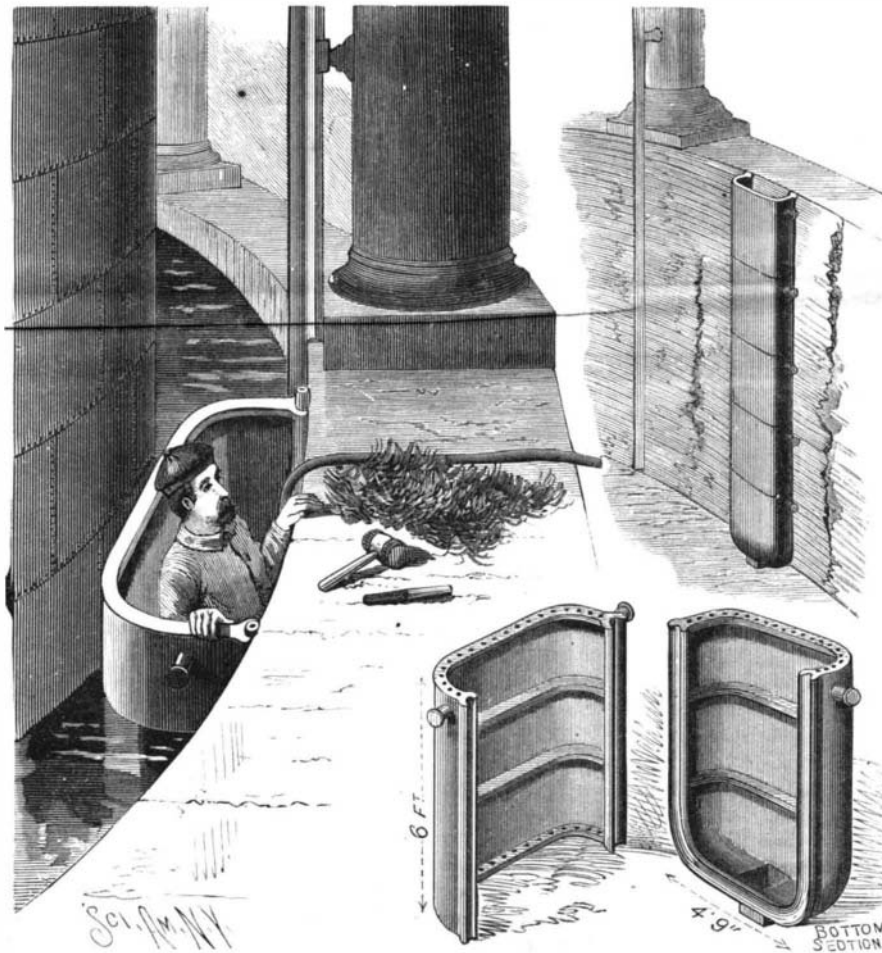
Gas.

There are, says President A. C. Wood, Amer. G. L. A., about 1,080 gas light companies in the United States and Canada, and of this number 153 are set down, in a recently published list, as water gas plants. The total number includes small and isolated plants erected for lighting factories, mills, summer residences, and hotels, as well as those erected as auxiliaries to established coal gas works, and exclusive plants for lighting towns, cities, and districts.

During the past twenty or more years, the projectors of various water gas schemes have been indefatigable in their exertions to induce the established companies to adopt their processes; and, either by force or through threats of competition, demands for large sums of money, or by purchase, they have only succeeded in establishing this small number of plants.

When a man or company of men projects and establishes an enterprise that is for the accommodation and benefit

of the public, they are to be commended and encouraged in such an undertaking. But I will defy the projectors of any water gas scheme to prove that, in a single instance, their operations have been for the public good or for the benefit of the gas consumer. Therefore it is not surprising that so few of the gas companies of the country have been induced to take



COFFER DAM AND SECTIONS.—DAM APPLIED TO TANK.