Where any portion of an embankment is greatly exposed to the wash of the sea or river, it may be protected from erosion by facing it with a layer of brushwood or reeds tied in bundles. Standing brushwood and trees on the outside of the embankments should also be preserved, and not cleared away, as is too often done; they form an efficient breakwater; such trees only should be cut which, being situated right on the edge of the foreshore, are, if the bank be abrupt and broken, liable to be blown down and thus aid in destroying the bank by the leverage of their roots.

Cattle should be carefully kept off newly-formed embankments, though the constant passing of foot-passengers along the top of the bund helps to consolidate the earthwork.

Always keep in mind the stringent necessity of at once repairing the smallest leak and making up the smallest sinking or depression. A nat-hole or crab-burrow filled up as soon as discovered, or a spadeful of earth applied in time, may save acres of standing crops and many hundreds of rupees worth of valuable property from destruction, as well as avert danger to the health of the people, from brackish inundation, and consequent death and decomposition of vegetable matters.

It is not within the scope of this work to enter into elaborate details of building operations or attempt a treatise on brickwork, but a few practical hints may be of use to unpractised and nonprofessional readers in carrying out and superintending minor necessary buildings, such as drain bridges, retaining walls, sluices, office buildings, or the like. It rarely happens now-a-days that any important Municipality or large civil station is

without a professional engineer, connected either with the Public Works, Road Cess, or Municipality, but it may, nevertheless, fall to the lot of others, as it has to mine, to superintend the construction of even large buildings, and bridges over considerable streams, without professional assistance, and as native contractors (like their confraternity all over the world) naturally seek to make the largest possible profit; and as native workmen, when not looked after, are sure to scamp work, a little knowledge of how work ought to be done will never be thrown away. The manner in which bricks are laid is termed bonding, and may be either what is termed old English bond or Flemish bond. In English bond, alternate courses of bricks are laid lengthwise with the length of the wall, and which are technically called stretchers, crossed by other courses in the thickness of the wall termed headers: bricks must always be so laid as to break joint; this is managed by the use of what are termed closers, i.e., bricks cut in two longitudinally, or transversely into four parts, one of these being placed next to and inside the first header from the end or corner of the wall. Flemish bond is made by placing a stretcher and a header alternately in the same course; for unplastered work it has a prettier appearance, and for walls one anda-half brick thick is the most convenient bond, but it has not the strength of English bond, and is apt to split on any settlement taking place. Bricks must not be laid too close together, as there will not in that case be a sufficiency of mortar to make solid work. The joints should be 3ths of an inch wide, and should be thoroughly well filled in with mortar. Bricks should be well soaked in water for at least an hour before they are

wanted for use, otherwise they abstract the moisture from the mortar and destroy its adhesive properties; and sufficient water should be used to keep the mortar plastic and the work moist, but not enough to wash the mortar out from between the joints. Every brick should not only be laid in its place, but should be rubbed and pressed down so as to force the mortar into the porce of the brick and secure firm adhesion. Bricks used in first class work should be of uniform size, sound and well burnt, straight and well shapen; a good brick gives, when struck with a hammer, a clear ringing sound. The mortar used should be one part pure fresh lime to two parts of soorkee made from well burnt or vitrified bricks, ground and screened through a soorkee screen with four meshes to the linear inch; the proportion of mortar used should be about 24 cubic feet (measured dry) to the 100 cubic feet of brick-work.

The courses of brick-work should be laid in regular straight lines, with a slight inclination of the bricks towards the middle of the wall, that one-half of the wall may act as a shore to the other half. Wall faces must be perfectly true and plumb; every course must be thoroughly grouted, i.e., well filled in with wet mortar, and the top of unfinished work should have a single brick built round and flooded with water or well moistened, and covered up with mats, palm leaves, straw, or the like, to prevent its drying too quickly. Good strong lasting masonry will never be obtained if the work is allowed to be baked up by the midday sun, or the lime washed out of the upper courses by heavy rain.

Arches require special care; they should, as a rule, be turned over properly-constructed wooden centers; but in India and in ordinary work, centers are generally constructed with dry bricks and clay, the upper surface. being plastered with clay and worked to the exact shape of the intrados, or soffit, that is to say, the underside of the arch: after this has been sanded over and allowed to dry, it is ready to build upon, and answers its purpose sufficiently well for ordinary work. The bricks are laid in concentric rings, on edge, the joints radiating truly from the center, the bricks firmly set with a mallet, and the joints carefully and thoroughly filled in with fine mortar and not more than quarter of an inch wide, the lower edges touching each other. In small arches the centerings may be struck as soon as the arch is completed, but in large arches it is necessary to give time for the mortar joints to set and harden before withdrawing the support of the centering; an arch should not be built upon until it has settled to its proper bearing.

In buildings where there is any fear of settlement and in wing walls and curtain-walls to bridges and sluices, the foundation should be laid on concrete, and in some cases piling may be necessary. Additional strength will be given by introducing hoop iron flatwise into the bond: the iron if slightly rusted, or the edges notched, will adhere better to the mortar; this adds little to the cost of the work but greatly to its stability. A large outfall sluice constructed some years ago (about 1869) on the banks of a tidal river and on a most treacherous foundation full of springs and quicksand, in which hoop-iron bond was introduced, has never since shown the slightest sign of fracture or settlement, although the structure it replaced had been twice carried away in the course of five or six years.

#### CHAPTER XXI.

"The horse, as at present treated, is the victim of ignorance, and is exposed to every abuse. Its welfare is secondary to the convenience of the master, and its custody is transferred to the unscrupulous cupidity of the servant."—Mayher.

The provision, feeding, and treatment of conservancy cattle is so often a source of trouble, that a few words on the subject may be of use.

The procuring of suitable cattle for conservancy work is becoming a serious difficulty in Lower Bengal, where there is no question that the breed of cattle is fast deteriorating. Of late years, owing to the influence of repeated famines, cyclones, the ravages of cattle epizootics, and the demand for transport purposes, created by the constantly recurring frontier wars, the difficulties in the way of procuring bulls, bullocks, and ponies have largely increased as well as their prices. A few years ago Brahminee bulls were so common as to be sometimes a serious annoyance in the villages and bazars. Now-a-days they are seldom procurable. The draught and plough cattle are small, light-boned, thin flanked, coarse-bred, and poor in flesh, unable to stand any heavy work and peculiarly susceptible to disease: in price they average from Rs. 25 to Rs. 35 each; but out of a collection of two or three hundred at any of the local cattle markets or

hauts, there are seldom a dozen to be found fit for conservancy work.

Ponies also are scarce and very inferior. The old stamp of country pony with a hill cross, short in the cannon bone and pastern, with flat legs and hard round feet, broad in the quarters, short and deep in the barrel, with stout crest and rather low thick shoulder, is now hardly to be found. Eight or ten years ago, after the Sonepore fair, I could pick up fifteen or twenty good ponies at reasonable prices, Rs. 40 to Rs. 45, at the Chitpore horse-marts any morning in the cold weather. Now, one may search the whole range of stables and not find five fit for cart-work, and those at three times the price. Further up country, no doubt, the difficulties are less. Close to Calcutta there are the three large Municipalities, the demand for hackney-carriage-cattle, and the requirements of numerous building and other contractors to swell the demand and raise prices.

For conservancy carts I much prefer ponies to horned cattle: they work quicker, draw better, last longer with ordinary care, and are much less subject to disease.

Mules, though strong quick workers, are troublesome and vicious. They fight in the yard, and are apt to bolt with the carts: they are also not so well fitted constitutionally for work in a damp hot climate. Buffaloes, though strong and hardy, are slow, lazy, and troublesome. Conservancy ponies get but little grooming or attention, nor do they, as a rule, require very much, though they should always be rubbed down on their return to the depôt, and the mud and dirt cleaned from their legs, and legs and feet dried. They require to be well housed and well fed: Close stables are unnecessary; but a good water-tight

thatched roof over them, and a hard dry floor under them, is essential for keeping them in health. Nothing is better than a well-made asphalted floor, with just sufficient slope, to prevent wet and urine from lodging about their feet and bedding. Every pony should have a blanket for the cold weather.

The ponies should be carefully examined by the overseers or other persons in immediate charge daily, to see that they are properly looked after, and are not worked with abrasions, saddle-galls, or sitfasts. Conservancy carters are a thoughtless, careless class, and will work cattle with deep sores sooner than report the matter. Harness should be carefully attended to, a badly stuffed or dilapidated saddle pad or collar is certain to result in a soreback or galled shoulder, not only causing needless suffering, but often laying up an animal for weeks. There are several forms of saddles and pads, but whatever form is used, care must be taken to see that it is always kept clear of the dorsal ridge, otherwise not only bad sores, but serious injury to the spine, may result.

The first appearance of a soreback is generally a small hardish swelling, tumour, or warble, and this, if neglected, will soon run into a serious, and perhaps irremediable, gall or a sitfast, requiring the use of the veterinary surgeon's knife for its removal and cure. On the first appearance of a warble, the back should be well and repeatedly washed with a strong solution of salt and water, the pony put off work for a day or two, and the saddle pad carefully examined and re-stuffed, if necessary, leaving a hollow in the stuffing over the tender part. A common habit of the carters must be watched for and checked by admonishment and fine, viz., riding on their carts—usually

on one shaft. This drags the weight unequally to one side. and is sure to gall the pony. After emptying the contents of the tip carts, the men constantly let the body of the cart fall back to its place on the shafting, instead of lowering it down by hand. This not only knocks the carts to pieces, but is apt to shock the ponies' spine and cause chink or ricking, and consequent paralysis and ruin to the animal.

Regular and careful shoeing must not be overlooked. Whenever a pony presents any appearance of sickness. such as dullness of eye, drooping of the head, staring coat, refusal to feed, running at the nostrils or swelling of the glands under the jaw, it should at once be segregated from the rest and kept under treatment and observation: its bedding should be burnt, and its bucket or feeding bag removed with it. In every depôt there should be a separate shed as far from the general shed as possible for keeping sick or suspected ponies when glanders or farcy are suspected. The advice of a veterinary surgeon should at once be obtained; but where none is available, the officer in charge must do his best. It does not follow that, because a pony has a profuse muco purulent discharge from the nostrils, with considerable swelling of the glands, that it is suffering from glanders; these appearances may probably be only the results of a bad cold neglected, and the swelling may, in young ponies, be the accompaniment of strangles, a troublesome but not dangerous disease. A warm shed, plenty of bedding, bran mashes, a stimulating lotion or liniment well rub. bed into the glands round the throat and up to the roots of the ears, and steaming the nostrils with boiling water poured over some hay in a bucket, with the addition of

spirits of turpentine, and a tonic, will generally effect a cure. If the disease be pronounced glanders, the animal must be destroyed, and the carcase buried in quicklime, the skin being slashed, and all bedding, blankets, rollers, and other things belonging to it burnt. The zinc. bucket and iron bits may be thoroughly disinfected by burning. Lampas is a common complaint: it is a swelling of the bars of the upper part of the mouth: it is seldom of much consequence, but prevents the pony from eating his corn, and so reduces its strength. A slight scarification of the bars with a sharp penknife, and a little salt rubbed in, will generally effect a cure. Feeding must be carefully attended to, and care taken that the carters do not sell the food, or feed goats. and rams with it. Three seers, or six pounds, of crushed food, with twenty bundles of hay and a small quantity of green grass, lucerne or guinea grass, is sufficient for an ordinary pony. When ponies are low in flesh or out of condition, a few pounds of carrots daily will be found a valuable restorative, and a spoonful of the following mixture in their feed will have a marvellous effect:

Ujwein, two pounds.
Sulphur, two pounds.
Black salt, two pounds.
Soormah (black antimony), one tolah.

These ingredients to be separately pounded fine, intimately mixed, and kept in a tin in a dry place.

Bullocks should be fed with peas, chopped straw, and oilcake. A mixture of peas crushed, wheat bran, Indian corn, and oilcake is sometimes given; but I prefer the broken peas mixed with finely cut straw and oilcake

and sufficient water to wet the mass. All cattle are kept in better health if allowed to graze occasionally where grass land is available, but bulls must not be turned loose to pasture, as they fight and injure each other.

When bulls are restive and troublesome in the carts, the cart-drivers sometimes have a trick of blinding them by putting the milky juice of the ranga chittra, or one of the euphorbias, in the eye. This causes a dull white opacity of the eyeball, completely obscuring and ultimately destroying the sight. It may be cured, if not of long standing, by a mild lunar caustic lotion, covering the eyes up, and sponging them with a decoction of poppyheads.

# GLOSSARY

Abdar

Abdarkhanah

Adhygunga

Âm

Âmah

Amultas

Asôc

'Atcha, kal korebo'

Austakoor

Baêr

Bân or bain

Bazaar

Bhagirutty Bherinda

Bhîtá Bhisty Biggah

Bilactie or velaitee

----- tentool

Bildar or beldar

Bôn or bûn Bon-kochu

Bokool or bokul Bôr or bûrr

- ... A domestic servant in charge of drinking-water.
- ... An apartment for the storage of drinking-water.
- ... The original course of the Ganges.
- ... Mango.
- ... Soft or badly-burnt brick.
- ... The Cassia fistula.
- ... The Jonesia Asôca.
- ... Very good, to-morrow I will do it.
- ... A pit for deposit of household refuse; a midden.
- ... The Zizyphus jujuba, or native plum.
- ... A common jungle tree (Avicennia tomentosa).
- ... Market; native business quarter, or quarter inhabited by camp-followers.
- ... The sacred stream of the Ganges.
- ... A common weed; a species of euphor-
- ... A homestead site.
- ... A Mahomedan water-carrier.
- ... A land measure ; third part of an acre.
- ... European.
- ... European tamarind (Adansonia).
- ... European gab (Diosperos kaki).
- ... A native working patrol, employed on embankments, &c.
- ... A thicket, wood, forest, jungle, wild.
- ... The wild arum; a common ditchside weed.
- ... The Mimusops elengi.
- ... The Ficus Indica.

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#### Boistum or Vaishnav Bokra (see Hentâl)

Bokra bon Boxwallah

Brahmun Brahminee bull

Bukayen

Burgah Bustee

#### Chaltâ Chamâr

Champâ Chingree Chowkats

Chundi-mundop

Chudder or chádar

Coolie Cottah

Culchi Cutcha

Cutcha-pucka

Dalpoorie

# Glossary.

... The worshippers of Vishnu.

... The Phœnix paludosa; Sunderbund shrub, wild salt water date.

... A thicket of bokra.

... A peripatetic vendor of sundries; a hawker.

... A Hindu of the priestly class.

... A bull dedicated to the deity.

... Melia sempervirens.

... A rafter.

... A village, a collection of huts, a native quarter.

... The Dellenia speciosa.

... A low caste of the Hindus; leather dressers, curriers, tanners, shoemakers, &c.

... The Michelia champaca.

... A species of prawn.

... An carthwork measurement 4'×4'×4', also the four sides of a door or window frame.

... The house of the Goddess Chandi, or Durgah, a public sitting room or reception hall.

... A sheet or covering for the body.

... A laborer.

... A land measure, the 20th part of a biggah, or 60th part of an acre.

... A common porous eartherware jar.

... Unripe, unfinished, unbaked; used in building or with reference to material to signify unbaked or sun-dried bricks and clay mortar.

... Half finished work, or work done with pucka or burnt brick, and inferior or clay mortar.

... A coarse cake made of dal, rice, and goor.

Debdaru	or	devdara
Degee has	an	n

#### Dhangur

Dhobee or dhopah Dhoob or doorva Dome

Dooars

Dosadh

Ghat

Ghogue

Gointah

Goleputta

Goolar Goor Goran

Gowalla

Goal or gowalghur Gowalpara

Gulab-jam Gullie Gunga

Guramie or ghorami

Hallalcore Hari

- ... The Uvaria longifolia.
- ... The country almond (Terminalia catappa).
- ... A laboring class, native of Chota Nagpore.
- ... A washerman.
- ... A common grass (Cynodon dactylon).
- ... A low caste of the Hindus, attendants at the burning ghat; carriers of corpses and carcases; basket-makers.
- ... A tract of country at the foot of the Himalayas.
- ... A low caste of the Hindus; breeders of pigs.
- ... A landing place; a flight of steps down to the water.
- ... A crab-hole, or leak in an embankment.
- ... A cake of dry cowdung for fuel (Bois de vache).
- ... A large leaf used for thatching (Nipá fruticans).
- ... A wild fig (Ficus guleria).
- ... Molasses.
- ... A wood used for posts or fuel (Rizophora decandra, or Ceriops Roxburghianus).
- ... A milkman or cow-keeper.
- ... A cowhouse or byre.
- ... A village or quarter inhabited by milkmen.
- ... The rose-apple (Jambosa vulgaris).
- ... A narrow lane.
- ... The river Ganges.
- ... A thatcher or hut-builder.

... Nightmen or scavengers in Bombay,

... A nightman or sweeper caste of Bengal.

Hât ... A periodical market. Hental or hurtal (see Bokra) ... The wild salt water date (Phonix paludosa). ... A nightman or sweeper caste of Heln Bengal. ... Artificial cinnabar ; vermilion. Hingool Jalla. ... A large porous earthenware jar for water, grain, &c. Jamrool ... The star-apple (Jambosa alba). ... The Lagerstræmia regina. Jaroul Jemadar ... A native officer; an overlooker over coolies. ... Well burnt or vetrified brick for road-Jhama or jhama khoah making. ... A bivalve found in the Sunderbund Jhangra oreeks. ... A swamp or large piece of water. Theel Jhinak ... A salt water shell found in the Sunderbunds. . Jullah ... A swamp or morass; lowlands under water in the rainy season. ... A forest, thicket, wild plants, and Jungle weeds. ... A low caste cultivator, North-West Kachhi Provinces. ... The Nauclea kadamba. Kadam or kuddum Kálábosh or kulboush ... A tank-fish of the carp species.

Kasia bagaun

Katla or cutla Kardahi Kashi Kela Kintal

... From Kasia, Kesia or Kash (Saccharum spontaneum), a tall species of

grass used in certain religious ceremonies, and Bagaun, a garden. ... A large tank-fish of the carp species.

... A flowering shrub (Grislea tomentosa).

... The Erythrina Indica.

... The plantain or banana.

... A collection of huts inhabited by the poorer Portuguese and Eurasians in Calcutta.

# Glossary.

... Broken brick for roadmaking and con-Khoah crete. Kunker ... Nodular limestone. Kuntal ... The jack tree (Artocarpus integri-Kúthbél ... The wood-apple (Feronia elephantum). ... To plaster with clay and cowdung. Leep ... A plain ; open grass land. Maidan Mali ... A gardener. ... A coarse cake or sweetmeat. Malpowa Mậtâm ... A level, mark, or bench-mark. Mehter ... A sweeper or nightman. ... A tark-fish of the carp species. Mirgal ... The country as distinguished from Mofnssil the town. Mohnllah ... A quarter or division of a town. ... A carrier of corpses. Moordafarash ... A degraded priest who performs Moripora Brahmun muntras or ceremonies at the cremation ground. ... A coarse species of grass (Cyperus Motu or mootho hexastachyus). ... A village headman, also a family Mundul name. Munkir and nakir ... The two interrogatory angels who question the soul of the departed Mahomedan. .. A kind of earth or gravel. Murrum Massack ... The goat skin bag in which the Mahomedan water carrier or bhisty carries water. Naila or nulla ... A stream or creek Nand ... A common earthenware tub. Nakir ... See Munkir. ... The Melia uzad. Neem

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#### Ooloo

# Glossary.

Paddy

Pagár

Panna

Peelah Peon

Pipal or peepul

Pucka

Pudma or puddo

Pyara

Raiyat or ryot Ranga chittra

Ruho, rooie, or rui

Saigoon

Seemul or simul

Shah

Shankari bazar

Shastras Singhara Sissoo Siriss Soondry Soormah Soorkee

Sandaish Sunderbunds ... A coarse grass, used for thatching (Imperata cylindrica).

... The rice plant; rice before being husked.

... A ditch and bank dividing two plots of land.

... Cryptogamie water plants; Algoe.

... Unburnt, yellow, unbaked brick.

.. A messenger; a gangsman over coolies.

... The Ficus religiosa.

... Well built; built with burnt brick and mortar.

... The lotus or water bean (Nelumbium speciosum).

... The guava (Psidium guajava).

... A peasant, cultivator, tenant.

... A common hedge plant; a species of euphorbia.

... A tank-fish of the carp species.

... Teak (Tectona grandis).

... Cotton tree (Bombax heptaphyllum).

... Acacia catechu.

... The bazar or quarter of the shell-

... The books of the sacred Hindu law.

... The water chestnut (Trapa bicornis).

... Dalbergia sissoo.

... Acacia sirissa.

... Heritiera litoralis.

... Black antimony.

... Pounded brick used for making mortar.

... A well privy.

... The forest of the Gangetic Delta.

... Rupee ; current coin.

Tacca

# Glossary

Taccus ... Tax, an adaptation of the English word.

Tâl ... A common palm in Bengal (Borassus flabelliformis).

Tentool ... Tamarind (Tamarindus Indica).
Teraie ... The land skirting the base of the

Himalayahs.

Thacoorbattie or thacoorbari ... The house of the Thacoor or God.

Ticca-garrie ... A hired carriage, the cab of the East.

Tikra ... The coarse earthenware rings used for lining wells in sandy or alluvial

soil, a potsherd.

Ujwein or ajowan ... The aromatic seed of an umbelliferous

plant, the Ptychotis ajuwan, which yields Thymol.

Zemindar ... A landholder, landlord.

August, 1880.

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