Contributors

Dean, G. A. 1813 or 1814-1898.

Publication/Creation

Stratford, Essex : S. Morris ; London : Simpkin, Marshall, and Co., 1849 (London : Waterlow and Sons, Printers, London Wall)

Persistent URL

https://wellcomecollection.org/works/hf3kv49f

License and attribution

This work has been identified as being free of known restrictions under copyright law, including all related and neighbouring rights and is being made available under the Creative Commons, Public Domain Mark.

You can copy, modify, distribute and perform the work, even for commercial purposes, without asking permission.



Wellcome Collection 183 Euston Road London NW1 2BE UK T +44 (0)20 7611 8722 E library@wellcomecollection.org https://wellcomecollection.org ESSAVS on AGRICULTURAL BUILDINGS with PLANS, SECTIONS &c.

he road loading from Liscard to Pou THESE NEW and extensive form buildings of Harold Littledalo, Esq., at Liscard Ac. The permises are rendered complement by a fail channey steam being used in all the operations for which it can be made available gh, however, into indicing, with their enclosed yards, over a large area, ine numerous uses to which they are applied and, the amount of basimas the numerous uses to which they are applied and, the amount of basimas the numerous uses to which they are applied and, the amount of basimas the numerous uses to which they are applied and, the amount of basimas the numerous uses the presented to be the most compact, and set he most convenient and appropriate, of any to be found in the United on. FARM BUILDINGS AT LISCARD, CHESHIRE. e, are pleasantly situated on gently elevated ground, on the p-yards, stack-yard, manager's house and garden, cottages, shrubnt), and cover about four statute acres, which include the im-Seacombe, about a mile from the orth side of

^{And}gordin.
^{The} buildings are of substantial brick-work, faced with sizes and alted and the second state of the secon

Littledala occupies about 510 acres of excellent hand in Liesard and the ag towning of Wallnery, the whole of which he has, by shift, capital, and wring industry, brought to a state of exitivation and productiveness far entry what was before known in that district, tring at the east side of the group of buildings, there is a ten-stall stable in horse. Opposite to this value there is in interest-bouss, and, man by, wall stable, for the shareful both theres that take out the milk to the custo-tion existing the state of the group of buildings.

a dyianing townil unremitting ind surposing what Extering at 0 for farm hores, a four-stall stabl mers in the neigh The piggery a hofy shed, open sheeping phase of the satural hore of the the satural hore of the satural hore the satural hore of the the satural hore of the satural hore of the the satural hore of the satural hore of the the satural hore of the satural hore of the the satural hore of the satural hore of the satural hore of the the satural hore of the satural hore of the satural hore of the the satural hore of the satural hore of the satural hore of the the satural hore of the satural hore of the satural hore of the the satural hore of the satural hore of the satural hore of the the satural hore of the satural hore of the satural hore of the the satural hore of the satural hore of the satural hore of the the satural hore of the satural hore of the satural hore of the the satural hore of the satural h

a) uses independent on the order. There are eight large playeds, under a player come mast in order. The positry-houses are immediately over the ing place of the play, which ascends to the house above them around hour of the play, which ascends to the house above them around the quadrangle three is an immediate value-tank, and outside the same splits the engine bolter at large the player is to an engine in the post before alleded to, and come a solution is a solution. The tank sepatian the engine hourse the is a small mark there is a to searcy the level of the ground, for the wave there is a small mark the level of the ground, for the use of the young ducks and the to searcy for the ground, for the use of the young ducks and the search of the ground, for the use of the young ducks and the search of the ground, for the use of the young ducks and the search of the ground, for the use of the young ducks and the search of the ground, for the use of the young ducks and the search of the ground, for the use of the young ducks and the search of the ground.

The shippons, or cow-houses, are particularly deserving of noises, both from their size and structure. Two of them contain 32 cows each, and one of them

16, or 80 in all. The stalls are wide, and are formed or partitioned with huge blass Weich flags or sides. The cows are all fastmed, two in each stall, in a manner that gives them foredom to start or lie, or to jurn on their sides. The hole manner is conveniently mere, and the set of jurn on their sides. The hole manner nam, which is introduce There is a room for ste re. The catting -mach into the bollers from the ste

and the Target spectral production and the tensor that a final distance signature. The starting -machine is forer is, and fixed that fixed are spectral of the spectral production in the product of the spectral production is a substance of the spectral production in the product of the spectral production is a substance of the spectral production in the product of the spectral production is a substance of the spectral production in the product of the spectral product of the spectral production is a substance of the spectral product of the spectr

of initiation, by producing a greater quantity of fool from a given areg. of land than was done before, but who, being a merchant, has proved that the active pursuits of commerce and agriculture may be harmonically and drantagoously combined for the general good, as well as the advancement of individual in-

816





We are indicided for this scatterable "Blustration to the Farmer's Measuring, a work of great practical volue to agriculturists.

FARM BUILDINGS AT LISCARD, CHESHIUE.



Supp. 60,140/0









IPIEIRSIPIECTIIVIE VIIEW OIF COTTAGES

ESSAYS

ON

THE CONSTRUCTION /9/9

Chur Lee

2.7. hyms.

2 of olden Ique

1849

Farm Buildings

OF

LABOURERS' COTTAGES.

BY G. A. DEAN,

ARCHITECT AND SURVEYOR, MEMBER OF THE "ROYAL AGRICULTURAL SOCIETY OF ENGLAND," &c. &c. &c.

Entered at Stationers' gall.

STRATFORD, ESSEX: S. MORRIS.

London :

SIMPKIN, MARSHALL, AND Co., STATIONERS' HALL COURT.

MDCCCXLIX.

[PRICE £1 11s. 6d. TO NON-SUBSCRIBERS.]

LONDON : WATERLOW AND SONS, PRINTERS, LONDON WALL.

*

.

ESSAY I.

ON THE PRINCIPLES OF CONSTRUCTION AND DISTRIBUTION OF FARM BUILDINGS;

WITH

OBSERVATIONS ON THE CHOICE OF SITE—SELECTION OF MATERIALS—THE FITNESS OF EACH CLASS OF BUILDINGS FOR THEIR INTENDED PURPOSES, AND THE ARRANGEMENT FOR A COMPLETE FARMSTEAD ON THE PRINCIPLES OF ECONOMY.

ILLUSTRATED WITH

PLANS, ELEVATIONS, AND SECTIONS,

ACCOMPANIED BY DETAILED SPECIFICATIONS AND ESTIMATES OF COST.

ESSAY II.

ON COTTAGES FOR LABOURERS;

SHOWING

THE BEST MODE OF CONSTRUCTION AS REGARDS ECONOMY—THE PRINCIPLES OF VENTILATION— . AND THE GENERAL ARRANGEMENT BEST SUITED TO THE WANTS OF THE LABOURER— HIS HEALTH, COMFORT, AND MORALITY.

ACCOMPANIED BY

PLANS, ELEVATIONS, SECTIONS, SPECIFICATIONS, &c.



Dedicated by Permission,

TO HIS ROYAL HIGHNESS PRINCE ALBERT, K.G.,

&c., &c., &c.

TO WHOM THE AUTHOR HUMBLY BEGS TO RETURN HIS MOST GRATEFUL THANKS FOR SO HIGH A PRIVILEGE.

THE ZEAL OF YOUR ROYAL HIGHNESS IN PROMOTING THE PROGRESS OF HUSBANDRY,

AND YOUR UNBOUNDED BENEVOLENCE TO THE POORER CLASSES, IN ATTENDING TO THEIR COMFORTS

AND WELL-BEING,

HAVE ENDEARED YOUR ROYAL HIGHNESS IN THE HEARTS OF ALL CLASSES

OF HER MAJESTY'S LOYAL SUBJECTS.

THAT OUR MOST GRACIOUS SOVEREIGN, AIDED BY THE BLESSINGS OF PROVIDENCE,

MAY LONG CONTINUE TO REIGN OVER THESE HAPPY LANDS

IN PEACE AND PROSPERITY ;

AND THAT

EVERY DOMESTIC HAPPINESS MAY ATTEND HER MAJESTY AND YOUR ROYAL HIGHNESS,

WILL EVER BE THE PRAYER OF

YOUR MOST DEVOTED

AND HUMBLE SERVANT,

G. A. DEAN.

STRATFORD, ESSEX. August, 1849.



ADDRESS.

THE Author of the following Essays embraces this opportunity of tendering his thanks to those Noblemen and Gentlemen who have been pleased to countenance and patronize his labors, and of assuring them it affords him the highest gratification to acknowledge the honor thus conferred upon him.

The encouragement he has received from several Members of the Council of the Royal Agricultural Society of England, and other Gentlemen eminent for their practical knowledge in Agricultural pursuits, has animated him in the progress of this undertaking, and gives him hope that his work will be found worthy of their support.



INTRODUCTION

то

ESSAYS ON FARM BUILDINGS

AND

LABOURERS' COTTAGES.

THE experience of the Author in matters relative to Agriculture, and the duties of his profession constantly calling his attention to the erection of farm buildings, have convinced him of the great disadvantages that farmers, who have badly arranged and incommodious Homesteads, labour under, and that all deficiency in accommodation is prejudicial to both landlord and tenant. Most of the farmsteads of the present day are, in this respect, greatly defective, and occasion to the farmer much loss, by requiring extra labour and causing a positive waste of manure; and in most respects are ill-calculated for the improved system of cultivation now adopted. These conclusions have not been drawn without due consideration, or without suggesting a remedy for the evils complained of.

At first sight it may appear superfluous to add to the volumes already published upon Farm Buildings, or Labourers' Cottages, more particularly the former; but an excuse, it is hoped, will be found for writing these Essays, they being illustrative of the practical method of erecting such buildings with greater utility, and especially with

INTRODUCTION.

more regard to economy than works on these subjects generally possess. In many of such works, too little consideration is given to the convenience of arrangement, economy of space, or material, and to the principles of construction. Some are deficient from the absence of detail drawings, and others from want of information respecting the cost of erection : even when the foregoing particulars appear to be correctly given, the plans are invariably on so small a scale, that they are useless for practical purposes ; although in most cases much attention and care is bestowed upon such plans to produce artistical effect. Perspective drawings may be necessary ; but the introduction of sunny skies, and imaginary landscapes, are foreign to architectural designs, and have a tendency to divert the attention from the most important points, and mislead the judgment in the consideration of their several merits.

The chief points to be considered in the designing of Farm Buildings and Labourers' Cottages are—convenience of arrangement, economy of material and space, ventilation, good drainage, and a facility of obtaining wholesome water. Farmers pay largely for labour; it is therefore essential to economise this item in every manner possible, and much is to be effected by having a good arrangement in the homestead, particularly of the cattle sheds.

The erection of farm buildings is commonly entrusted to builders (sometimes to journeymen) who frequently are unacquainted with the requirements of a farm. Few architects (generally speaking) have much knowledge in agricultural pursuits, and other persons who do possess such information, are seldom skilled in the art of construction, or in the value of materials.

The writer, in adverting to himself, takes the liberty of stating, that he was born on a farm, and his family, as well as many of his friends, are either agriculturists, or connected in some way with landed property. He has for many years been extensively employed in designing, and superintending the erection of buildings for

ü

INTRODUCTION.

agricultural purposes, and hundreds of dwellings for the labouring classes. When so employed, he has always endeavoured to give the greatest amount of accommodation, at the least possible expense.

Farm Buildings may undoubtedly be erected to afford much greater accommodation than the majority of such buildings now possess, and with equal regard to economy in the outlay, if judgment be displayed in the choice of material and in the mode of arrangement,—by adopting a more economical principle of construction,---and by turning to good account every local advantage. Never, perhaps, did Agriculture stand in greater need of the aid of science and skill than at the present moment. Free trade having probably lowered the market value of both grain and cattle, it is apparent that a greater quantity must be raised, and that, too, at a cheaper rate than at present; otherwise, landed property will, as a consequent, decrease in value. To assist the farmer in competing with foreigners, of adding to the comforts and improving the morality of the labourer, and the economical investment of capital, are objects, the promotion of which is sought in the following Essays.

While in the present enlightened age, Agriculture, as a science, is rapidly advancing, and receiving impetus from the assistance of scientific men, and the encouragement held out by the "Royal Agricultural Society" for its further development, it is with pleasure we find the comforts of the labourer who carries out the operations of the farm are now taken into consideration, and that the landowner is desirous of improving his dwelling, and promoting his general welfare. Cottages for labourers have not hitherto been comprehended under that description of property considered as eligible for the investment of capital; they are mostly rude, inconvenient, and comfortless abodes, scarcely affording necessary shelter. This is to be attributed, in a great measure, to the employment of artificers who neither possess skill in construction, nor judgment in distribution, and also from the attention of landowners not having been

INTRODUCTION.

directed to that which is most important—their being made to compensate, in a pecuniary point of view, for money so invested.

Philanthropists may be induced to build cottages, irrespective of the small amount of income derivable therefrom; but the comforts of the poor should not be left solely to the impulse of humanity while there exists a possibility of erecting for their use substantial dwellings, that will yield a remunerative profit upon such outlay. This may be effected, with every consideration to health, comfort, and convenience, if the instructions hereafter given be judiciously carried out.

The information afforded throughout this work is of a purely practical character. The plans, together with the specifications, are so prepared as to be easy of application, and the building operations are so fully described, that any intelligent builder will be enabled to execute any of the several works.

It has been considered desirable to estimate the cost of each class of buildings severally; as entire homesteads are seldom required : but additions and alterations to them are in constant demand.

iv

HIS ROYAL HIGHNESS PRINCE ALBERT, K.G., &c., &c., &c.

HIS GRACE THE DUKE OF NORFOLK, K.G.P.C.

HIS GRACE THE DUKE OF SUTHERLAND, K.G.

THE MOST NOBLE THE MARQUIS OF BREADALBANE, K.T.

THE MOST NOBLE THE MARQUIS OF NORTHAMPTON, K.G.

THE MOST NOBLE THE MARQUIS OF SALISBURY, K.G.P.C.

THE RIGHT HONOURABLE THE EARL OF CARLISLE, K.G.P.C.

THE RIGHT HONOURABLE THE EARL OF SPENCER, K.G.C.B. THE RIGHT HONOURABLE THE EARL OF LIVERPOOL, G.C.B., P.C.

THE RIGHT HONOURABLE THE EARL OF LONSDALE, P.C.

THE RIGHT HONOURABLE THE EARL OF BURLINGTON.

THE RIGHT HONOURABLE THE EARL OF WEMYSS AND MARCH.

THE RIGHT HONOURABLE THE EARL OF LEICESTER.

THE RIGHT HONOURABLE LORD HILL.

THE RIGHT HONOURABLE LORD VISCOUNT COMBERMERE, G.C.B., G.C.H., P.C.

THE HONOURABLE R. H. CLIVE, M.P.

- Sir E. BLACKET, Bart., Matjen, Northumberland. Sir E. N. BUXTON, Bart., M.P., Leytonstone House,
- Essex. Sir C. HULSE, Bart., Breamore House, Hants.
- Sir J. W. JOHNSON, Bart., M.P., Hackness, Yorkshire,
- Sir J. KEY, Bart., Billiter-square, London.
- Sir H. MEUX, Bart.. M.P., Theobald's Park, Cheshunt, Herts.
- Sir J. H. PELLY, Bart., Upton, West Ham, Essex. Sir M. W. RIDLEY, Bart., Blogdon, Morpeth.
- Colonel AUSTEN, M.P., Kippington, near Seven
- Oaks, Kent.
- T. W. BRAMSTON, Esq., M.P., Skreens, Chelmsford, Essex.
- J. C. COBBOLD, Esq., M.P., Ipswich.

- W. S. CRAWFORD, Esq., M.P., Crawfordsburn, Hollywood, Down, Ireland.
- H. DRUMMOND, Esq., M.P., Chester-square, London.
- G. MOFFATT, Esq., M.P., Eaton-square, London.
- S. M. PETO, Esq., M.P., Russell-square, London.
- R. A. SLANEY, Esq., M.P., Suffolk-street, Pall Mall, London.
- Lieutenant-Colonel FADDY, R.A., Woolwich, Kent. General Addison, Chilton Lodge, Suffolk.
- Major-General WEMYSS, Cumberland Lodge, Windsor Park.
- Colonel CHALLONER, Portnal Park, Virginia Waters. Colonel M'Dowall Logan, N.B.
- Colonel RAWSTORNE, Penwortham Hall, near Preston, Lancashire.

ADAMS, W., Esq., Wood Grange, West Ham, Essex. ADAMS, M., Esq., Surveyor, Isleworth, Middlesex.

- ALEPSON, Messrs., and Company, Copthall-buildings, City, London.
- ALLCARD, J., Esq., Burton House, near Bakewell, Derbyshire.
- ARNOLD, S. W., Esq., Walthamstow, Essex. (4 copies.)
- BARKER, T. Raymond, Esq., Hambledon, near Henley-on-Thames.

BEAZELEY, S., Esq., Architect, Soho-square, London.

- BENN, Joseph, Esq., Architect, Lowther Castle.
- BIDDER, G. P., Esq., C.E., Great George-street, Westminster.
- BLANSHARD, H., Esq., Great Ormond-street, London.
- BLENKARNE, J., Esq., Architect, Newark, Notts.
- BLEWIT, W., Esq., Rainham, Essex. (2 copies.)
- BOLGER. H., Esq., Holkam, Norfolk.

BOYCE, G. A., Esq., Architect, Tiverton, Devon. BRANDRETH, H., Esq., Houghton House, near Dunstaple, Bedfordshire, Sheriff of Bedfordshire.

BROOKE, G., Esq., Forest Gate, West Ham, Essex. BROWN, J., Esq., Wingeworth Hall, Chesterfield. BURBECK, H., Esq., Norwich.

- BURGE, J., Esq., Dalby-terrace, Islington.
- BURKE, J. French, Esq., Club Chambers, Regentstreet, London. (6 copies.)

CHAMPNESS, T., Esq., Surveyor, Abridge, Essex. CHARRINGTON, Messrs., and Company, Mile-end, Middlesex.

CHERRY, — Esq., Principal Veterinary Surgeon to the Army, Clapham Common, Surrey.

CIRCUIT, T., Esq., Brambles, Upminster, Essex.

- COBBETT, W., Esq., Enfield, Middlesex. (2 copies.) COBBETT, D., Esq., Architect, Railway-place, Fen-
- church-street, London. COBB, H., Esq., Surveyor, Lincoln's-inn-fields,
- London.

- COOKE, W. F., Esq., Elliott Lodge, Blackheath, Kent.
- CORBISHLEY, R., Esq., Wood-street, Cheapside, London.
- COTTON, W., Esq., F.R.S. & D.C.L., Wallwood House, Leytonstone, Essex.
- COVERDALE, J., Esq., Ingatestone Hall, Essex.
- CRAWTER, H., Esq., Jun., Surveyor, Southampton Buildings, Chancery Lane.
- CURE, CAPEL, Esq., Blake Hall, Ongar, Essex.
- CURTIS, T., Esq., Salway House, Stratford, Essex.
- CURTIS, R. L., Esq., Stratford, Essex.

CURTIS, E., Esq., Stratford, Essex.

DACRE, G., Esq., Stratford and Walton-on-the-Naze, Essex.

- DAVIS, J., Esq., Cranbrook Park, Ilford, Essex.
- DEAN, J., Esq., Surveyor, Tottenham, Middlesex.
- DEXTER, R., Esq., Surveyor, Mile-end-road, London.
- DOWMAN, W., Esq., Sudbury, Suffolk.
- DOWMAN, W., Esq., Junior, Sudbury, Suffolk.
- DOWN, T., Esq., Architect, Bridgewater, Somerset. DUCKWORTH, J., Esq., Surveyor, Barnet, Herts.
- EAST, R. V., Esq., Spalding, Lincolnshire. EIVERS, J., Esq., Surveyor, Buckingham-street, Strand.

ELLIOT, John, Esq., Rickmansworth.

Eve, W., Esq., Manor Farm, North Ockendon, Essex.

FIELD, R., Esq., Pergo Park, Havering, Essex.

- FIRMIN, J., Esq., Goldenham Hall, Bulmer, Essex. FRANCE, J. R. Wilson, Esq., Rawcliffe Hall, near Preston, Lancashire.
- FREEBODY, W. Y., Esq., C.E., Duke-street, Westminster.
- FREEMAN, R., Esq., Pemberton Road, Clapton Downs, Middlesex.

FULLER, C., Esq., Basinghall-street, London.

vi

- GADSDEN, H. F., Esq., Surveyor, Old Broad-street, London.
- GIBBS, B. T. Brandreth, Esq., Honorary Secretary Smithfield Club, Half-Moon-street, Piccadilly.

GINGELL, J., Esq., Wood House, East Ham, Essex.

- GOLDEN, J., Esq., C. E., South Town, Yarmouth.
- GOODAY, J. F. S., Sudbury, Suffolk. (2 copies.)
- GRAHAM, J., Esq., Agricultural Chemist, Stratford, Essex. (2 copies.)
- GRAY, W. J., Esq., Coldingham.
- GREEN, C., Esq., Surveyor, Chadwell, Essex.
- GURNEY, Samuel, Esq., Ham House, Upton, Essex. (6 copies.)
- GURNEY, S., Junior, Esq., The Culvers, Carshalton, Surrey.
- GURNEY, H. E., Esq., Upton Lane House, Upton, Essex.
- HAINES, H., Esq., Surveyor, Moorgate-street, London.
- HAMMACK, J. G., Esq., Architect, Essex House, Mile-end-Road, London.
- HOLCOMBE, C. T., Esq., Valentines, near Ilford, Essex.
- HowITT, M. Esq., Burrows Farm, Hendon, Middlesex.
- HULSE, C., Esq., Hurst Lodge, near Twyford, Berks. (2 copies.)

JUTSUM, E., Esq., Gibbs-at-Perry, Romford, Essex.

- KINDER, J., Esq., Gould-square, Crutched Friars, London,
- KIRSOP, J., Esq., Fore-street, Cripplegate, London.
- LAMB, B., Esq., St. David-street, Trinity-square, London.
- LAVENDER, Esq., Architect, Swindon.

- LEIFCHILD, W., Esq., Surveyor, Moorgate-street, London.
- LEWIS, B., Esq., Cornwall-terrace, Regent's Park, and Oakwood Lodge, Ide Hill, near Seven Oaks.
- LOMAX, E., Esq., C.E., Waterworks Chambers, Trafalgar-square, London.
- MARTIN, T., Esq., Argyle-street, Regent-street, London.
- MAXWELL, W., Esq., Plashett House, West Ham, Essex.
- MAY, J., Esq., Pite Villa, Peckham, Surrey. (2 copies.)
- MEλκIN, W. F., Esq., Architect, Tokenhouse Yard, London.
- MECHI, J. J., Esq., Tiptree Hall, Kelvedon, Essex.
- MILWARD, R., Esq., Great George-street, Hanoversquare, London.
- MORRIS, S., Esq., Architect, Stamford Hill.

NYREN, J. W., Esq., Stratford, Essex.

- PAXTON, J., Esq., F.L.S. and H.S., Chatworth, Derbyshire.
- PAXTON, W., Esq., Little Copped Hall, Epping, Essex.
- PEACOCK, A., Esq., Longbridge House, Shepton Mallet, Somersetshire. (3 copies.)
- PEACOCK, A. D., Esq., Steward-street, Spitalsquare, London.
- PEMBERTON, R., Esq., Valewood Lodge, Romford, Essex.

PENZER, E., Esq., Bridgnorth.

PICKERING AND SMITH, Messrs., Surveyors, Whitehall-place, Westminster.

PIKE, C. J., Esq., Plymouth. (3 copies.)

PONSFORD, W., Esq., Brentwood, Essex.

PowLes, T. W., Esq., Barham Lodge, Elstree, Herts.

vii

Powrss, E. A., Esq., Plymouth. (2 copies.) PRICKETT, G., Esq., Surveyor, Southampton-build-

ings, Chancery-lane, London. Римсиляр, С., Esq., Blunt's Hall, near Haverhill, Suffolk.

RANSOME, F., Esq., Ipswich, Suffolk.

RAYNBIRD, R., Esq., Hengrave, Bury St. Edmonds, Suffolk.

REES, J., Esq., Grove, Stratford, Essex. (2 copies.) ROUND, C. G., Esq., Birch Hall, Essex.

SAGE, E., Esq., Furze House, Dagenham, Essex.

SAGE, R., Esq., Architect, Swindon.

SHAW, W., Esq., Farmers' Fire and Life Insurance Office, 346, Strand, London.

SHEARBIERNE, ----- Esq., Beden, Dorking.

SKILLING, T., Esq., Ardfry Castle, Oranmore, County Galway, Ireland.

SMITH, G., Esq., F.S.A., Barham House, Herts.

SMITH, G., Esq., Architect, Mercers' Hall, London. SMITH, E., Esq., Architect, Old Swinford, near

Stourbridge, Worcestershire.

SMITH, J. S., Esq., Surveyor, Hamilton Street, Camden Town, London. (2 copies.)

STEADMAN, E., Esq., Belle Vue, Sudbury, Suffolk.

THOMPSON, J. S., Esq., Clements, Ilford, Essex.

- TITE, W., Esq., F.R.S., St. Helen's-place, Bishopsgate-street, London.
- TRESS, R., Esq., Architect, Little St. Thomas Apostle, London.

TRESS, W., Esq., Architect, Wilson-street, Finsbury, London. (3 copies.)

TROTT, J., Esq., Architect, Manor Road, South Hackney, Middlesex.

TUCKER, J., Esq., West Ham Abbey, Essex.

TUDOR, S., Esq., Bromley, Middlesex.

WARD, — Esq., Junior, Architect, Eastwood House, Hanley, Staffordshire.

WESTBURY, Giles, Esq., Mayor of Andover.

WHITEREAD, W. H., Esq., Southill, Biggleswade, Bedfordshire.

WHITE, J. M., Esq., Lincoln's-inn-fields, London.

WILD, R., Esq., Hounsditch, London.

WINGFIELD, W. W., Esq., Lowndes-square, Belgrave-square.

viii

ESSAY I.

FARM BUILDINGS.

ON

In submitting the following Essay and accompanying Plans, to the consideration of those Noblemen and Gentlemen who have honoured the writer by subscribing to his productions, he begs leave to be allowed to state, he has long perceived that great improvement might be effected in the construction and arrangement of farmsteads generally; so that the fixed capital of the landowner, and the circulating capital of the farmer, may be beneficially employed in unison.

Land produces a less rate of interest upon the amount of capital invested, than almost any other description of property; the chief inducements to purchase it, being the good security it affords, the prospective increase in value which may reasonably be expected from the application of science and skill, and the pleasurable associations connected with its possession.

One material cause of the return being so small, arises from injudicious outlays, in erecting expensive buildings in an improper manner, and of a comparatively useless character. Another, from the omission of sufficient sheds for sheltering cattle from the inclemency of the weather : where this is the case, it often happens that the farmer who has to encounter a wet and severe winter, will lose more money by his cattle than would suffice to erect a moderately sized shed; it being well known to graziers that warmth is essential in the fattening of heavy cattle. This want of shelter compels the farmer to purchase lean stock from distant counties, oftentimes at a great disadvantage; whereas, did circumstances permit him to rear and fatten stock bred upon his farm, his profits would probably be increased beyond those he could obtain by fattening only. In addition to these advantages, he would be benefited by B

the increased quantity and improved quality of the manure made by the stall-fed stock. It is almost superfluous to state that the use of manure is absolutely necessary in making a farm profitable.

The most highly cultivated farms are those on which the most stock is fed; and it is on these farms the best crops are grown. Where little stock is kept, and the land poor, the crops are invariably bad. Profit is the stimulus to every man of business: the manufacturer adopts every possible means of making the most of his stock-in-trade, and constructs and arranges his premises with that sole view: as the farmer is now considered a manufacturer of produce, his homestead should therefore be constructed and arranged with a similar view; and this object is of such importance, that no solvent man, skilled in his business, will become the tenant of an occupation or holding destitute of this desideratum. When the homestead is bad or inefficient, the result often is, that a person of limited means becomes the tenant, who, if he has to contend against one or two bad seasons, from necessity neglects both the land and premises; the landlord ultimately loses his rent, is put to great expense in effecting repairs, and finally receives back the land in an impoverished condition.

There is no doubt that by exercising skill and care, the expenditure upon farm buildings may, in general, be diminished considerably; affording at the same time increased accommodation, combined with economy of labour. The sums paid for the latter are formidable items in farming operations; the economising it, consequently, should be particularly attended to, especially in those buildings intended to be occupied by live stock. It is also desirable that the house of the farmer be so placed that he may possess a good view of the farmstead; and although it is not to be supposed that he can conduct the business of his farm from the windows of his dwelling, still the uncertainty whether the eye of the master is upon the movements of his servants, operates beneficially upon their conduct.

Before the plan of a homestead can be laid down judiciously, it will be necessary to become acquainted with the manner in which it is intended to farm the land—the quantity of arable and pasture comprised in the farm, and the locality in which it is situate; as the homestead required for one where grain is chiefly grown should be differently arranged from a stock, grazing or dairy farm, or from one situate near a large town : the grazing farm requiring the least, and the arable the greatest number of buildings. The one situate near the town, having facilities for disposing of live

3

stock and general produce, and of obtaining proportionably larger quantities of manure, would require less accommodation than one differently located.

The accompanying designs are calculated to afford the accommodation requisite for a *farm of about* 400 *acres in extent*, supposing the land to be divided thus—threefourths arable, and the remainder being laid down in grass. Although there may be peculiarities connected with some estates, which will prevent the arrangements in the designs being carried out exactly as shewn, still the principle of construction and arrangement is applicable in every instance.

In designing buildings it should be remembered, that circumstances may induce a change in the system of cultivation; consequently, they should be so constructed as to be easily converted to other purposes than those for which they were originally intended, without incurring much additional expense. Timber buildings for temporary, or even permanent purposes, may be erected on blocks of wood or stone, and put together with screws and nuts, instead of nails, that they may be taken down with facility, and erected on any other portion of the premises if required. (Not being attached to the freehold, they can be at any time removed by the tenant, if erected by him.)

The site for the homestead is of importance, and requires great consideration; where practicable it should be on the south side of a hill, and as nearly central as possible with the arable land. This position gives great facility for manuring the soil, carting home the produce, and performing the various farming operations in the most economical manner. Railroads having become the highways of England, they should be made serviceable by erecting the homestead as near to them as possible. Several farmers, whose lands abut upon railways, have already made, or are making, tramways to them from their farm-yards, for the purpose of conveying their produce to market, and for bringing home manure.

It is the province of the architect to see that an abundant and wholesome supply of water be obtained, which will, in some instances, determine the site, especially where much live stock is kept. In most instances it may be cheaply obtained by sinking wells. Its quality may be judged of by its clearness, and by continuing clear upon the application of certain chemical tests; the clearest water is not always the most wholesome, for the transparent water of some wells is very hard, from holding a considerable quantity of calcareous earth or its salts in solution (generally sulphate of lime), the presence of which may be ascertained by adding a few drops of solution of oxalate

Water

of ammonia; this will instantly render the water turbid, the calcareous matter entering into a new combination, and forming an insoluble salt of lime, which is precipitated. *Hardness of water* may also be ascertained by testing it with a solution of soap in spirits of wine; if the water is hard the soap is instantly curdled. Water much impregnated with lime or magnesia is highly injurious to the health of men or cattle, and promotes the formation of calculi and gouty secretions.

Rain water is soft, and therefore valuable. All that which falls upon the buildings should be collected, and conveyed by pipes to cisterns, instead of allowing it to wash and waste the manure in the fodder yards: but before it enters the cisterns it should pass through a perforated slate filter about 2 feet wide, 3 feet deep, and 3 feet long, filled with coarse charcoal, small pebbles (or gravel), and fine sand; the cost of which will be but a few shillings.*

The quantity of rain which falls upon the roofs of buildings will seldom be sufficient to supply the cattle, but it will be very desirable to obtain even this, particularly in chalky districts. The depth of rain falling in twelve months is calculated to be 18 inches: the quantity that falls upon the buildings may be easily ascertained.

Artesian wells are, in some situations, a certain means of obtaining a good supply of water, and although expensive to sink, the expense may in some instances be justified. A few years since the late Mr. Curtis, of West Thurrock, in Essex, the proprietor of a landed estate in that neighbourhood, a portion of which was marsh land, called "saltings," and abutting upon the River Thames, found his cattle and sheep die off rapidly when put on the aforesaid marshes, in consequence of the mineral impregnations, and stagnant state of the water in the ditches, which induced him to sink a number of these wells; the water from which proved excellent, and was an effectual preventive of the disease induced by the use of the surface and ditch water.

The Surfaces of Farm Yards are frequently of a soft and porous nature. Manure collected and stored upon such a basis must necessarily lose a large quantity of its valuable properties by absorption of the salts which are liberated and washed out by rain, independently of the injury cattle sustain in health, by lying on the wet and trodden litter, incorporated with their manure.

If a layer of gravel (or chalk according to circumstances) be spread over

* A plan of one is given in the accompanying Designs. (See Plate No. 4.)

Rain. Writer

18 Anain Falls -

Farm Mard

the yards, and a small quantity of stone-lime ground and mixed with it (if gravel be used), a hard crust will be formed, upon which the rain, saturated with the soluble parts of the manure exposed to its action, will flow to the lowest place, and may from thence be conveyed by channel-drains, to tanks made for its collection. Brick tanks, if properly made, are suitable for this purpose; but if only coated with cement, are seldom water-tight, especially if the ground is of a loose or porous texture.

Tanks may be constructed with brick work, in an efficient and economical manner, either for the reception of water or liquid manure.

When large in size, they are expensive to construct; but if, instead of one large tank, several smaller ones are made, the cost will be less, the premises drained more rapidly, and a saving in the quantity of drain pipes effected. The strongest and cheapest mode of forming them, is when the length is equal to two or three times the breadth, having partitions across them. The proper position for them is shewn in Plate No. 1.

The next consideration is the general drainage of the homestead. It very seldom happens that the site is so dry, as not to require underground drainage; this purpose is best effected by having drains around the external boundary of the farmstead, and one main drain running through the centre of the premises, into which the drainage from any minor ones may be conveyed. The drains should be sufficiently deep in the ground to be free from injury by loaded vehicles passing over them. They may be made of earthenware, which is cheaper, more efficacious, and less liable to injury by vermin, than brick work. The main drain will, in most instances, be sufficiently capacious when it is 20 inches in depth, and in form, oval, or egg-shaped. The branch-drains should be about 4 inches diameter and perforated. Similar drains to the last should convey the urine from the cattle-sheds to the tanks which receive the liquid manure, except that they should not be perforated.

If roadways, from 14 to 16 feet in width, be made in front of the various buildings, great comfort and convenience will be afforded, as the yard would then be kept firm and dry, and access given for the conveyance of food or produce to or from the granary, barn, store, and cattle-sheds; the expense of forming them being inconsiderable, in comparison with the advantages to be derived from their use. (See Plate No. 1.)

The centres of Yards are generally the lowest places, but in the accompanying designs they are raised, having a fall towards the tanks, which are shewn by dotted lines,

Roadways -

Mard -

5

Manure

Frains.

Janky -

(see Plate No. 1). The yards being formed slightly convex, or shelving towards the tanks, all the liquid washed out of the manure by the rain, may be collected in the tanks, the value of which upon grass, young clover, and compost heaps, is now well known. If a sufficient fall can be obtained, it may be conveyed from the tanks, by drains, direct to the fields, by which means two or three fields near the homestead may be considerably fertilized at a small expense.

The Buildings should not be crowded, but extended freely in any direction that *Buildings* - may be desirable, and designed to suit the class of animals intended to be placed therein. They should, where practicable, form three sides of a square, or parallelogram, being open to the south for the purpose of obtaining warmth and shelter from cold winds.

> The sheds should be roomy, for preserving the health of the cattle, and constructed so as to allow of extension if required. In the designs, although accommodation is calculated for a farm of 400 acres only, it may be increased to suit one of 1000 acres, or more, if requisite, without affecting the general arrangement of the homestead.

> *Each class of buildings* should be distinct from every other, and ventilation particularly attended to. No loft should be erected over the stalls in cattle-sheds or stables; this would render them close and hot, and much impede the ventilation; the interior should therefore be open to the roof.

It has been proposed to *cover the entire area* of farmsteads with buildings, and the Rev. Mr. Cook, of Seamer, in Suffolk, has adopted this plan. It appears to be bad in principle and costly in construction; as thus, when the roofs are several, and join, valley-gutters must be formed; these must or should be of lead, which is expensive. Some of the roofs will also be higher than others. Under such an arrangement of sheds, the heat from its large expanse of roofs must be very great during the summer months; neither can any convenient mode of ventilation be adopted : besides, horses require a different temperature from oxen; the latter, while fattening, should be kept very quiet, which cannot be the case here, as they will be continually disturbed by workmen feeding them, by horses coming in from and going out to their work, and by the carters who attend them.

The fundamental principles by which an architect should be guided in forming sheds for cattle, is their size and form, the latter being, more or less, wedge shape, thus, —a moderate sized horse is about 8 feet long, 6 feet 6 inches high to the top of the head, 2 feet broad behind, and 10 inches across the head. A bullock, about 7 feet



6 inches in length, 5 feet in height, 2 feet 6 inches broad at the hind quarters, and about the same across the horns, (although the latter dimensions depend upon the breed of the animal). Sheep are on the average 3 feet 6 inches long, 1 foot 8 inches across the hind quarters, and about 12 inches at the head, allowing for the horns. Swine are about the same size as sheep, varying like them according to the breed. From these data, buildings may be erected in the most economical and commodious manner, especially when the sheds are to be circular.

More loose cattle can be fed in a circular shed, than in one of any other form; and may be divided to suit circumstances. The proper radius for the inner circle is fifty-four feet.

When the cultivation of the land is of a mixed character, a perfect homestead should comprise a barn, granary, machine-house, straw, implement, and store sheds; stables, with spaces partitioned off, for containing harness and stable utensils; cattle- he guared _ sheds, with stalls for sick cattle; steaming, brewing, tool, and poultry houses; dairy, sheep-fold, piggery, and shelter-sheds, a blacksmith's and carpenter's shop, chaise-house, and, under some circumstances, a slaughter-house.*

Previously to commencing building operations the plans should be well digested, so that alterations of any magnitude may be avoided. The altering of a design after the works have been begun is sure to entail extra expense. The most satisfactory, and the cheapest manner of building is by contract, if a competent architect be appointed to superintend the works. It will be his duty cautiously to guard against all extras, and a clause should be inserted in the contract, "that no sum beyond the amount specified will be paid to the contractor, unless an order is produced signed by the surveyor, as having authorized such additional expense, incurred by extra works, or otherwise."

As the general practice is to advance to the contractor about 75 per cent. on the value of the work executed, he should be required to ensure the buildings from fire, in an approved Fire Office; or the owner should reserve to himself the power of insuring the buildings, deducting the expense thereof from the amount of the contract. Provision should also be made in the contract for the surveyor, or building owner, to have the power of completing the works after a stated time, should a cessation of operations

* The expense of erecting the foregoing buildings is not so great as from the enumeration may be expected. (See Estimate of Cost.)

7

Buildings

take place from any cause whatever, without the consent of the architect or owner. This is very important in cases of bankruptcy or insolvency.

The selection of the materials to be used in the construction of the various buildings, must in a great measure depend upon the facility of obtaining them: the natural produce of the locality being made available, if practicable. For walls, the most solid and durable are stone or brick, although timber is used in some districts, and in others clay; the latter is unsuited to the science now displayed in agricultural affairs. The usual coverings are of thatch, tiles, slate, and felt; and, recently, to a certain extent, of galvanized and corrugated iron.*

Thatch, of either straw or reeds, is a close and warm covering, but harbours birds and vermin, and is more liable to take fire than any other description of roof. When used, it should be covered externally with a coating of strong mortar, laid on with a trowel; this will prevent birds from perforating it, and make it more secure against injury from high winds.

Plain Tiles are a heavy and an expensive covering, as are also pan-tiles; they require constant repairs, and a large scantling of rafter to support them; when either is used, they should be pointed with mortar on the under side.

Slates are durable and light in weight; when they can be obtained by water carriage, are also very cheap; where used for roofing, they should overlap each other, and be laid hollow, on deal boards, or battens; if the latter, they should be three inches wide, about three-fourths of an inch in thickness, and nailed down with copper, zinc, or galvanized iron nails. Slates require no pointing, and being light in weight, a small scantling of rafter is sufficient to support them. The ridges may be formed with slate, and laid in a cement made with oil-putty and lampblack. If the slates are laid hollow, the building will be thoroughly ventilated, and if carefully executed, and a sharp pitch given to the roof, neither rain nor snow will penetrate between them. The best in quality are those from Kendal, in Westmoreland, and next to these, the Bangor slates. *Good Slates* are of a light blue, or bluish-green colour, have a clear bell-like sound, and retain less moisture than those of a dark blue :

^{*} The cheapest building is not that which can be erected at the least cost, but that which is substantially constructed with durable and suitable materials, affording at the same time the greatest amount of accommodation.

in touch they are hard and rough. Those which possess a smooth and greasy appearance are bad in quality.

Felt is a very light covering, but its durability and capability of keeping out the weather for any length of time is questionable : neither does it offer any security against fire.

Galvanized and Corrugated Iron is a very good and durable material for roofing; it requires less timber for its support than any other description of covering, and from not being combustible, is valuable on that account alone. Iron protected by a perfect coating of zinc, although exposed to all weathers, will not change. The roofing of the Houses of Parliament is formed with plates of zinc'd iron: zinc has the property of soon becoming incrusted with a thin coating of oxide, which, of itself, is a protection against any further corrosion from the effects of the atmosphere.*

The descriptions of Timber that may be enumerated as being most useful for building purposes are, oak, fir, elm, poplar, and beech. Of these, oak, from its greater value, will be precluded from general use in farm buildings or cottages for labourers; but in some cases, its locality, or other circumstances, may render its use quite as economical as other kinds. Fir is chiefly used for girders and framing in general, on account of its lightness and inflexibility; it is also less liable to warp than other timber, especially when in boards or small scantling. The Red or Yellow Fir (pinus sylvestris) is the best, and most durable, of the whole species. It is indigenous to the hills of Scotland, Denmark, Lapland, Russia, Sweden, and Norway. That imported from Norway, seldom or ever exceeds 18 inches in diameter, and although the sap-wood is considerable, the heart-wood is stronger, and more durable, than that of the larger trees of other countries. The Russian timber is considered to lose much of its quality from the length of time occupied in getting it from the interior to Cronstadt, from which port it is shipped for this country.

Yellow Pine is full of .turpentine, and possesses greater strength and durability than white. In the best pine timber, the annual rings are thin, seldom exceeding onetenth of an inch in thickness, the darker parts of the rings being of a bright reddish colour : the wood is hard and dry to the touch, does not leave a woolly surface after the saw, or clog its teeth with resin. The annual rings in the inferior kinds of fir, are

С

^{*} The cost of a square of 100 feet super. of thatch is about £2 5s.. ; plain tiles, £1 18s. ; pantiles, £1 8s. ; slate, £1 5s. ; felt, 14s. ; galvanized iron, not corrugated, £2 14s. ; if corrugated, 8s. extra.

generally thick, the wood heavy, and filled with a soft resinous matter—feels clammy, and chokes the saw. Some of these inferior descriptions are spongy, contain less resinous matter than the better sorts, and are also woolly in the sawing. Much of the Swedish timber imported is of this latter quality, and though clean and free from knots, does not possess that strength and stiffness which render the growth of other countries superior.

The White Fir (pinus abies), commonly called spruce, is inferior to yellow: it is imported from Christiana mostly as deals or planks. This wood takes glue better than the yellow sorts; it is used chiefly in the interiors of buildings, and where continually dry, is very durable. American, or White Pine (pinus strobus) is a native of North America; this timber is imported as logs, which are of great length and size. It is not considered durable, and being very susceptible of the dry rot, should not be used for girders, or in any situation where it is subject to much strain.

The *Pitch Pine (resinosa)*, remarkable for the quantity and fragrance of the resin it produces, is a native of Canada; its timber is brittle when dry, and though heavy and full of turpentine, is not lasting. It is of a much redder hue than Scotch or other European pines, and from its glutinous property is difficult to plane.

Larch may also be advantageously used; it is of rapid growth, and if grown in an elevated situation, is very durable; it possesses great strength, which makes it suitable for framing, and almost every description of carpenters' and joiners' work. It will not easily take fire, nor split by the driving of nails, neither will worms attack it; from its hardness, it is well adapted for posts, rails, barn and cottage floors, or use in any situation, where the wear is great. When used for joiners' work and well finished off, the grain has a pleasing appearance, and if varnished, not much inferior to that of wainscot. Larch Pine was largely used by Scammozzi at Venice; who in his writings speaks very highly of its quality for all building purposes. It was extensively used by the Romans, and is still used both in Italy and Switzerland; in the latter country particularly, for pipes to convey water for the purposes of irrigation. It is to be regretted that this valuable timber-tree is not more cultivated in this country; as it will grow in almost any soil or situation. The Duke of Athol is the only person who has yet grown it to any extent.

There are three species of Larch: one European and two American. The European (*pinus larix*) is a native of Italy, Germany, Siberia, and Switzerland; that from the Italian Alps being the most esteemed.

The American Black Larch or Tamarack (pinus pendula), and the American Red (pinus microcarpa), are neither of them equal in quality to the European, although both are very good. The European Larch is generally of a honey-yellow colour, the hard part of the annual rings being of a redder cast : from its hardness it requires a considerable time to season; it is less liable to shrink than any other kind of fir, nor will it split with the grain to any considerable length; the crossing and strength of its fibres, and the closeness of its grain, enable it to resist twisting.

Elm may be used for rafters, quartering, weather-boarding, or any purpose where it will remain constantly wet or dry; for piles its value is well known; that which was used in the foundations of Old London Bridge, upon its removal, was found to be in excellent preservation. Much of the elm used many years since in barns and other buildings, for rafters and weather-boards, may be seen at the present time quite sound. Hertfordshire and Essex afford many instances of this.

The Poplar is a very useful tree, of which there are five species common in this country. The Abele or great white, the grey, the aspen (or trembling), the *black*, and the Lombardy. The black, grey, and Lombardy, are most esteemed; all of which may be used as boards for flooring in any situation where the wear is not great. Poplar does not split on being nailed, nor does it readily take fire; and as neither mice, wood-lice, or mites will attack it, it is well adapted for the woodwork of cheese-rooms. After being felled, it should remain two or three years to season before being used.

Beech (fagus sylvatica), like elm, is very durable, when either constantly wet or dry; but is very liable to injury from worms, or those insects that prey on wood; in damp situations it quickly decays. On account of its propensity to warp, it is unsuited for boards.

Alder is very subject to dry rot, and attack from worms; and consequently is unfit for building purposes: it is, however, good for piles. According to Vitruvius, all the buildings of Ravenna stand upon alder-piles.

The proper period for felling trees, is when they are in full vigour and perfection. If felled before they have attained their full growth, the greater portion of the wood is sappy, and even the heart-wood of young trees is not so durable; if allowed to stand after they have arrived at maturity, the wood is brittle and soon decays. The time for felling trees is from December to February, as the sap is then down.

The best mode of seasoning timber is, to remove it (when felled), to a dry

situation, placing the logs so as to have a free circulation of air around them. The trunks, as soon as felled, should be rough-squared, and not left exposed to the sun; each log should be laid on blocks, stowed under cover, and left until well seasoned; otherwise it will twist and warp.

The foundations of walls are most cheaply made with concrete composed of lime and gravel, which is an excellent substitute for either brick or stone for such purposes.

The walls of the buildings should be of bricks or stone, the selection of which will depend much upon local circumstances. Where the advantages do not preponderate in favour of the latter, bricks should have the preference. Stone, even for the roughest walls, requires much preparation, and cannot be so readily laid as brick. In the use of bricks, the labour and expense is less, and the whole work can be carried on with greater dispatch.

In some districts stone may be the material selected, from its abounding there naturally, which will render its use more economical than that of brick. Many parts of this country yield stone in large quantities, and of excellent quality, for building purposes; and frequently so near the surface, that it can be quarried without much labour or expense—as the ragstone of Kent—the freestone of Somersetshire—the limestone of Yorkshire—and the sandstone of some of the Midland and Northern Counties, all of which are well suited for the purposes here treated upon.

Sandstone is in its formation laminated, and in some districts much more so than in others; it also requires more attention in its use than that, the structure of which is solid. When the laminæ is thin, more care is required in squaring off the edges and in bedding, as the face of work which is exposed to the weather should be fair and solid; this description of stone being much more liable to injury, from its free and porous nature.

The more compact descriptions of stone simply require rough squaring, observing to keep the surface intended for each course tolerably even, which will economise the use of mortar, and make the work more solid.

In the neighbourhoods of quarries, small, or rubble stone, which can frequently be obtained for little more than the cost of cartage, may be used with great advantage; especially if lime is made in the locality, more mortar being used in rubble walling than for brick or squared stone. Lime is in some districts a very expensive material.

Rubble Walls, if well built, are strong and durable, and may also be made sightly in appearance; in their construction they should always be coursed—that is, laid in regular beds with line and level; the work, when performed in this manner, is much sounder than if laid roughly, or uncoursed. By being laid in parallel beds, the work can be better finished off by pointing, and made fair on the face, which will keep out the weather more effectually. A few larger stones should be laid at intervals as bond, both in the body of the work, as well as in quoins, jaumbs, &c.

In many cases, the common flint, which is found in chalky districts, will supply a useful and cheap material for walls, and if they are properly knapped (or dressed), and the whole well laid in strong mortar, make substantial work. When flints are used, the arches, quoins, and jaumbs, must be formed either of brick, or other stone than flint. Buildings erected in this manner are very durable and ornamental in appearance.

The Buildings of the Farmstead next present themselves, which should be considered seriatim. The materials to be used in their construction,—the purpose to which each is applicable, with the most judicious and economical arrangement,—their proper drainage and ventilation,—and the position each should occupy in the steading.

It has already been stated, that the form best adapted for a complete homestead, is that of a parallelogram, having the front (or one side) open to the south; the reasons for which are obvious, and will appear more at large as the several buildings, together with their uses, present themselves for consideration; beginning with the barn, which, from its importance, and its occupying the centre of the north side of the parallelogram, forms the most conspicuous feature in the whole range.

The Barn, being generally the highest building in the farmstead, should be placed on the north side of the yard, thus giving the greatest shelter from cold winds; and as a great portion of the food consumed by live stock is there prepared, the cattle-sheds and stables should be contiguous, which will save much labour in the carrying of fodder to and fro. The same reasons should determine the site of the granary, which should be near, if not immediately adjoining. In the barn there should be two bays for the storing of unthrashed corn or straw, with a thrashing-floor in the centre. The thrashing-floor being thus placed, waggons and carts may be conveniently brought in to unload during harvest, or from the ricks. The bays should be sufficiently capacious to hold the contents of a moderately sized rick, although it is desirable to make them as small as possible, on account of the cost of erection.

Buildings The Farmstead

Barn -
As Barns, when large in size, are costly in their erection, it should be calculated whether it would not be profitable to lay down a tramway or railway from the rickyard to the barn, and to build the ricks on frames having wheels, so that they may be moved bodily into the barn. By the adoption of this plan, a much smaller building will suffice. Other advantages are also to be gained by this convenient method of moving ricks bodily. Under ordinary circumstances, the corn has to be moved several times in its progress from the rick to the thrashing-machine; being first loaded from the rick on to the waggons or carts, then thrown into the bay, and finally into the thrashingmachine, which repeated moving and throwing about occasions much waste—here the whole rick can be moved into the barn direct, and placed at once conveniently for supplying the machine; by which much labour and time is saved—loss prevented by the grain shelling out—and the inconvenience and damage occasioned by bad weather avoided. Further, in the event of fire, the ricks may be detached, or run on the tramway to the extremity of the yard, and probably out of danger.*

When the *Machine House* adjoins the barn, and the machinery is worked by horses, an additional advantage will be derived from the circumstance of the barn possessing the north side of the parallelogram as described in plan; the trackshed will then be always sheltered from the mid-day sun, and should be so arranged as to be open to the cool breeze, which is always generated by shade. When water is the motive power, the site of the barn and machine-house will be determined by its source.

The Barn may be constructed with any of the foregoing descriptions of materials; but a solid wall should, under any circumstance, be erected to the height of four or five feet from the ground, which will give solidity and strength to the building;—prevent dampness—and be a great check to the ingress of vermin. The whole area should be covered with concrete, composed of six parts of clean gravel (or small stone and sand), to one of ground-stone or lias lime, to the depth of about six inches. The thrashingfloor should be formed with oak planks laid on oak sleepers; the space under the floor, between the sleepers, being filled with broken bottles or flint stones, up to within half

* Some persons advocate the system of unloading corn from the fields and ricks, on the outside of the barn, throwing it through loopholes, which is a very bad one; it occasions much waste, in consequence of the ears of the corn striking against the framing of the loopholes, and more labour is required for unloading; even with these advantages it cannot be done in wet weather.

an inch of the underside of the planks, well rammed, and grout cement or mortar poured over the whole, so as to form a compact mass, leaving no harbour for rats or other vermin. The doors should be divided, both vertically and horizontally, to avoid the great strain which the story-posts would otherwise be subject to : when made in this manner they are more convenient and easily opened and shut. A portion of one of the bays should be appropriated for conveniently feeding the thrashing-machine, and behind this bay the machine-house should be placed ; the area of which may be covered with concrete a few inches in thickness, as described for barn floors.

The Granary should be raised about seven feet from the ground; the lower space may be used as a straw-shed, chaff-house, or general provision store. It should also adjoin the machine-house, that the power there employed may be used for bruising oats, and oil-cake, grinding beans, and cutting chaff and turnips; all of which operations may be performed at one time. The objection to placing the granary over the thrashing-floor of the barn is, that unless very high up, it will prevent waggons or carts laden with unthrashed corn entering the barn, and this during harvest time is of importance, as labour is then more valuable; such position is also incompatible with the tram-way arrangement previously alluded to: when so placed it is less convenient, and is, besides, a very expensive mode of construction. The same objections hold good with respect to placing the thrashing-machine over the thrashing-floor.

The floor should be of yellow deal, $1\frac{1}{2}$ inches thick, and laid on joists, supported by girders of sufficient strength, as the weight it has to sustain will be great. The joists should not have a longer bearing than eight feet; particularly as the girders may be supported by columns rising from the shed below.

The walls should be lined with boards to the height of six feet all round the interior of the building, to prevent seeds or grain (stored within) coming in immediate contact with them—this will protect the seeds from damp, which is highly injurious. All walls are hygrometic—more or less—and convey dampness from the exterior, which would be communicated to the grain stored against them :—much corn is frequently spoiled by mildew from this circumstance, which boarding will prevent. Divisions should be formed to contain the various descriptions of grain and seeds ; also for the machinery for grinding beans, peas, &c. A loft may be made in the roof, or battened shelves placed round the walls over the binns, for containing sacks, baskets, sieves, &c.

All grain requires to be kept cool, dry, and well-aired ; which, if not strictly

15

Granary-

attended to, soon becomes infested with the weevil, which is so destructive to grain : to prevent this, it should be occasionally turned, and the building well ventilated.

The Ventilation is best effected by fixing in the back and front walls, and above the boarding just mentioned, framed luffer-boarding hung on pivots, and made to work as Venetian blinds are worked, which will admit a current of air to pass freely through, and exclude all wet. A crane, with hoisting tackle, should be fixed outside the building, and a step-ladder for communication from below. A space about 18 inches square should be cut in the floor, and a funnel inserted for the passage of oats, beans, meal, and bruised oil-cake.

The Implement Shed is a necessary and important building ; all working utensils should be kept dry and under cover. When left exposed to the weather, more wear and tear is occasioned by the action of the rain and sun, than by actual use. This building should be divided into two or more compartments; the larger being appropriated to the waggons, carts, ploughs, and the ordinary implements of husbandry, not easily injured; the smaller, which should be enclosed with lock-up doors, for the reception of the more important, such as drilling and other machines, and for all loose The building should be sufficiently high to admit of loaded waggons or carts tools. being drawn under : the front on the side facing the yard should be open to the roof, and a gateway, or pair of folding-doors, in the opposite or back wall, when the rick-yard is beyond it. The roof of this shed, over that part which is to be left open in front, should be supported by piers, or columns of wood or iron : whatever material be used for this purpose, the supporters should be well protected by guard stones, or timber spurs, to prevent injury by waggons or carts running against them.

Good and commodious *Cattle Sheds* are of primary importance; and no design for these can be perfect, the details of which do not efficiently provide for and secure the following essentials, viz.—*Warmth*; with a *regular* and *even temperature*; a *good ventilation*, free from injurious draughts, a perfect *drainage*, with arrangements for cleanliness and collection of the ordure; a *convenient mode of foddering*, without disturbance to the cattle; a *good supply of water*; and *economy of space*. Consideration should also be given to the *anatomical structure* of the animals, their *physiology*, and their *natural habits*; that the buildings may be properly *adapted* to each *class*. The structure of *horned animals* is not so intricate as that of the *horse*; they will, in consequence, bear the variation and extremes of heat and cold much better, particularly those from the

Inplement Shed -

battle

Highlands of Scotland and Wales; neither do they require so much space in the stalls as horses. *Neat cattle* may be tied up until fat—the milch cows around London and all the manufacturing towns are thus confined, for even two or three years; but the horse will be injured in health, if kept in the stall only a few days without exercise.

Particular attention should be paid to properly *drain* and *ventilate* all buildings in which cattle are stalled, as the atmosphere is much influenced by the heat which emanates from their bodies, and by their evacuations.

Good drainage, warmth, light, and pure air, are promoters of health; but judgment is required to ascertain and apportion the necessary degree of temperature and ventilation. Too much light occasions restlessness; and excess of heat encourages the propagation of insects (especially flies), which greatly annoy cattle—while undisturbed rest facilitates their fattening. It frequently happens that cattle, while tied up, will suddenly lose flesh, although regularly and properly fed; this proceeds from a derangement of their system, frequently caused by want of proper accommodation, and the inhaling of a vitiated atmosphere—the source of pulmonary complaints. The loss of a single animal by disease is a misfortune; but the evil is much more serious, when the general health of the whole stock is affected from the above causes; the food supplied under such circumstances becomes a total loss—besides the decrease in value occasioned by their depreciated and low condition.

The sheds should be about 13 feet wide, exclusive of the feeding-passage, and the interior open upwards to the roof; the walls about 7 feet high; and the doors folding-hatch doors, *i. e.*, divided horizontally and vertically; these should all be placed on the same side of the building, to prevent cross-currents of air. When the sheds are large, two or more will be found both useful and convenient; and being hung to open outwards, will not interfere with the interior arrangement. The doors, being several, will give additional means of ventilation in hot weather, facilitate the passage of oxen in or out from the sheds, and prevent the disturbance of others.

Framed luffer-boarding, as described for the granary, or loopholes, as shewn at *a* in plate 8, should be inserted in the walls for the entrance of fresh air, and (if necessary) ventilators placed in the roof for the escape of foul; but if the roofs are covered with slates, laid hollow, sufficient ventilation will be obtained.

The Stalls may be constructed in a very simple, yet efficient manner, having only fir uprights, with two side or connecting-bars about 5 feet long. The uprights

should stand upon small stone or timber bases, mortised to receive the tenon of the post; the upper end tenoned, and fastened by a shifting pin into the tye-beams extending across the shed, which should have slots to receive them. The tye-beams may be arranged at proper distances for this purpose. In cases of accident, it is very desirable to be enabled to take down the framing of the stalls with facility, to extricate a bullock, or remove him. By adopting this method, the stalls can be easily done away with, and (if required) the building appropriated to other purposes. The practice of sinking the hinder or heelpost in the ground is a bad one; it is more expensive than the mode here described, without possessing the advantages. The space usually allowed in the stalls for a pair of Devonshire oxen is from 8 feet to 9 feet.

Bricks laid flat in cement, or well-tempered clay, on a level and well-rammed surface, will make a good pavement for these sheds; or concrete alone will do, laid about 6 inches thick. The *paving* should be laid perfectly level, lengthwise, but in the stalls a slight fall may be given from the sides to the centre, without prejudice to the cattle; which will considerably facilitate the drainage. When laid in a sloping direction along the stalls, it throws the cattle too much on their hind-quarters, often *producing lameness*, and in cows, *abortion*, from their slipping. *Small channel-drains* should be laid about one-third the distance up the centre of the stalls, and covered with *perforated* slate or stone, the perforations being about a quarter-of-an-inch on the upper, and half-an-inch on the under side; or iron gratings may be used—the covers to be so fixed, that they may be easily taken up for the purpose of cleansing. These drains should communicate with others leading to the manure-tanks in the yards.

At the centre of each shed, lengthwise, outside (but communicating with the shed) a small enclosure should be erected, sufficient in size for containing an ordinary lift-pump, for supplying the cattle with water. The *well* for this purpose may be in any convenient spot sufficiently contiguous, but not where liable to contamination from the drainage of the sheds or yards. To the nozzle of the pump, a pipe or shoot may be attached, for leading the water to the nearest water-trough in the centre manger ; the other mangers on either side may be connected to this by means of wrought-iron pipes, screwed and fastened with nuts ; the whole range of which will thus be supplied with water at one time, and the labour of carrying it in buckets avoided. Water in the shed will also be convenient for cleansing the mangers, or cooling the shed in hot weather. The pump should be properly enclosed, and the suction-pipe leading from the well, laid sufficiently

2 6 ton Stog

deep in the ground, to protect it against frost. This supply of water should be obtained, and (if possible) made independent of any other source, for the general consumption of the steading. Where a steam-engine is erected, a very commodious tank can be made to answer as a roof for the engine-house, and which will have sufficient elevation to supply the whole premises. This tank can be filled from a pump worked by the engine.

By leaving a passage at the heads of the bullocks, about 3 feet wide, the cattle may be conveniently fed, and the disturbance occasioned by passing between them for this purpose avoided.

The mangers are best made of iron, and should be fixed not higher than 18 inches from the ground, having *three divisions*, if the bullocks stand in pairs—two for food, and the centre one for water. The one used for water having a wood cover, to prevent the food falling in while the cattle are feeding. If there is no passage at their heads, the mangers should be brought about 9 inches from the walls; otherwise the horns of the bullocks will prevent them getting at their food comfortably. The distance between the walls and the mangers should be filled up solid to the height of 6 inches above the *back* of the mangers, and sloping upwards towards the wall.

The best method of tying up cattle is with chains, having swivels in them to prevent knotting, and fastened by rings working in long iron staples; the staples being fixed to the stall-framing with screw-bolts and nuts.

In some counties, farmers allow the manure to accumulate under the bullocks to a height of 2 or 3 feet, considering that its ammonia, and other valuable properties, are most effectually preserved by so doing. When this system is adopted, the mangers have to be *raised* as the manure *accumulates*; the bars of the stalls will also require shifting, for which an additional slot or groove can be provided in the posts, and the bars fastened by pins. A layer of furze, potato-haulm, or bean-stems, should be laid over the paving, to facilitate the drainage of the urine.

"Cattle-boxes," in many districts, are preferred to stalls; the cheapest mode of constructing them is given in the annexed specifications, and a plan of one, on the most approved principle, is shewn in Plate 8. It will be perceived, on referring to the section of this plan, that a *raised causeway* or passage, 4 feet wide, is formed *along* the centre of the *shed*, and boxes shewn on each side, which will admit of the cattle being fed with the least amount of labour. The short posts, or piles, of the dwarf wharfing, which

Papage

Mangers -

battle Boxes -

19

will form the *sides* of this causeway, must be placed at distances answering to the width of the boxes, the head-posts of which can be conveniently fixed to them by bolts, or they may be made to drop into iron staples; cleats may also be screwed on for the support of the mangers.

Some farmers prefer feeding bullocks in *pairs*, and others *singly*. In the former, the size of the boxes should be about 14 feet by 10 feet, and in the latter, 10 feet by 8 feet in width will be sufficient; but if a passage is formed behind the bullocks for driving them out or for shifting them—then an additional depth in the boxes is required, equal to the width of the passage. This will be found convenient, and should not be omitted, especially if the economy of room is unimportant.

If the practice of allowing the manure to accumulate is adopted, and in conjunction with the use of boxes, then, under this arrangement the manure may remain until required to be carted on the land. *Folding-hatch doors*, sufficiently wide to admit a cart for taking away the manure, should be provided for each box; which will also afford additional means of cooling the shed in warm weather, as they may remain open if a bar is placed across each, to prevent the escape of the cattle—these will form the lockingbars to the gates. The space over the feeding passage may be used as a hay-loft, or for any other suitable purpose.

Commodious cattle-sheds give the means of *soiling* neat cattle. Sir John Sinclair, in his "Code of Agriculture," p. 487, reckons "one acre of grass soiled, is equal to three used in pasture;" independently of the increase of manure thereby obtained; which, with the avoidance of poaching the land in wet weather, are additional advantages derived from this mode of feeding.

The Cow-house may adjoin the cattle-sheds, and the stalls arranged in a similar manner. If oxen are placed in the same shed with cows, they may stand in rows across the sheds, with their heads facing each other, and the feeding passage left between them. The food left, or refused by the oxen, can then be given to the cows.

The manure from cows when fed on green meat is generally loose, and if allowed to enter the drains will soon cause a stoppage. To remedy this, an *open channel-drain*, about 12 inches wide and 3 inches deep, should be made to receive the dung as it falls; this drain should run along the shed about 8 feet from the mangers. The sides should be perpendicular, and the bottom flat; a *semicircular form* is objectionable, as the cattle treading in, are liable to slip in crossing to the stalls. The bottom of this channel-drain

should be perforated; and *under this* another drain should be formed, to receive and carry off the liquid to the tanks. All the drains should be trapped with syphon traps, to prevent the return of noxious vapour and the entrance of vermin. Small cesspools, about 18 inches square and 2 feet deep, should be formed at certain distances along the channel-drain, to receive the solid manure, which should every day be carried away to the dung-pit. A hoe should be provided, about 11 inches wide, for drawing the manure to the cesspools.

The Calf-house should be divided from, or made distinct from the Cow-house, as the bleating of the calves is a great disturbance to the cows; it should also be partitioned off into pens, for those which are intended for the butcher. They should not be placed together in pairs, but singly, and tied up as described for bullocks; when together they are apt to lick each other; those required for rearing may be placed by themselves. The size of the pens should be about 8 feet by 4 feet. Calves are required to be kept very clean and quiet. The building should be well ventilated by means of luffer-boarding. The floor may be formed of concrete, as before described, and laid in a sloping direction; over this, but on sleepers, should be laid a boarded floor, perforated with holes half-an-inch in diameter, connected with grooves, thus:- %%? This floor is best made in *compartments*, and hung with hinges to the sleepers; 2000 so that the whole may be conveniently raised for the purpose of removing such excrementitious matter as may pass through, which if suffered to accumulate would render the floor damp, and the atmosphere of the building impure. The sparred floors generally in use cause a great waste of straw, the sharp hoofs of the calves cutting it against the edges.

The Root-shed should be paved with brick or stone, and the doors made sufficiently wide to admit of a cart being backed in, for the convenience of shooting in bulk; for this purpose, a tramway of stone should be laid, for keeping the cart wheels off the pavement. This shed should be near to those for cattle; but when the number of cattle kept is large, and the shed extended, its proper position will be in the centre (lengthwise) of the cattle-shed. A pump should be fixed in the shed; also a tank, or large tub for washing. The shed should not be placed very near to the steaming-house, as all succulent roots are injured, more or less, by steam or heat.

The Stables should be placed in such a position that workmen may have access Stables to them, without passing through the yards and courts where cattle are kept.

The Horse, from being in a highly artificial state, is much predisposed to inflam-

Shed -

ball

House -

matory action of the viscera, and requires to be treated with great care; consequently all stables should be *cool*, properly *ventilated*, well *paved*, and thoroughly *drained*.

Stables should be from 16 feet to 18 feet wide between the walls; the walls about 8 feet high, and the interior of the buildings open upwards to the roof. The *doors* should *open outwards*, and all the *fastenings sunk* in them, to prevent damage to the horses, by their running against them, when suddenly going in or out; or accident by the harness catching and getting entangled.

These buildings may be ventilated by means of luffer-boards, answering as windows, but when glazed sashes are used, the luffer framing may be hung outside to act as shutters; the sashes should be made to slide past each other in grooves. The temperature should be about 45° or 50° in winter, and from 60° to 65° in summer. Excess of light is prejudicial, producing restlessness; therefore no more should be admitted than is sufficient to enable the workmen to cleanse the stables.

The best materials for the *pavement* are *Dutch clinkers*, or small square granite, which unquestionably are superior to any other descriptions for this purpose, and in the end the most economical. Asphalte will not stand against the iron shoes of horses, and the common pebble paving, from its uneven surface, and its soon wearing into holes, leaves lodgments for the urine, which soon becomes putrescent, and gives off ammonia accompanied with a fetid odour. Powdered gypsum scattered over the paving two or three times per week will remedy much of this evil, by its combining permanently with the ammonia; and will add much to the cleanliness of the stable. All paving should be kept dry, and even on the surface; this will effect a great saving in the litter, and keep the atmosphere more wholesome.

Oak blocks, or blocks of any hard wood, which from its texture is not a great absorbent, forms a good and warm pavement.*

A portion of each stable should be partitioned off for containing the harness, also the chaff and corn-binns: recesses may also be formed in the wall behind the horses, for placing in the harness daily used, also currycombs, brushes, and stable utensils. These recesses should have sliding-doors, as the ammonia from the urine perishes leather, and acts strongly upon all brasswork.

* The "Metropolitan Wood Paving Company" lay down very excellent paving for this purpose, also for floors of barns, since very little corn is now thrashed with the flail.

Stalls, or divisions of a suitable description, should always be used, otherwise accidents will frequently occur by the horses kicking or biting each other. There should be a screen at the division of each stall, about 2 feet wide, separating the mangers, as some horses eat more ravenously than others, and should be prevented from robbing their neighbours; it also enables the owner to ascertain if any horse is "off his feed," as loss of appetite is an indicator of internal disease.

The stall divisions should be about 6 feet apart, and may be framed as described for cattle-sheds at page 18; but the posts should be oval in form, to prevent injury to the horses, should they run against them: the whole framing, if so constructed, will be removable, and in their places "Horse-boxes" may be readily formed when The Stalls for Nag-stables should be about 7 feet high at the mangers, required. 5 feet high at the hinder end, and 8 feet long. The expense of loose boxes (unless made in the manner here described), may be considered too great for working horses, although they are unquestionably the best; many that will not lie down in undivided stables, will do so in boxes or even in stalls.* The mangers may be either of wood or iron, and should be about 3 feet long, 8 inches deep, and 15 inches wide; the back part being rather higher than the front. The preference should be given to cast-iron; racks are also best made of this material. Many persons consider that the racks are best placed by the sides of the mangers, as the hay-seeds are apt to fall into the eyes of the horses, when they are placed above their heads; others, that horses who work hard should have no rack-meat given to them, considering that they satisfy their hunger much quicker and better when fed from the manger, and consequently have more time for rest. This mode of manger feeding has come much into practice, and is probably the most economical for draught horses.

The best means of securing horses in their stalls is with halters, having double ropes or chains, with stop-blocks at their ends; the ropes or chains working in separate rings fixed on the manger: each horse is thus confined to the centre of the stall, and cannot reach those next him. Cast-iron or wood brackets may be fixed in the harness-room and recesses, for hanging on the harness in frequent use. These brackets should be slightly inclined upwards, to prevent the harness slipping off, and have hooks at the bottom for head-stalls, reins, &c. Wire-gauze lanterns are the safest and best for stable use, and should be hung with weights, lines, and pulleys.

* Stalls of cast-iron may be seen at Messrs. Cottam and Hallows, London, ready for use.

Com binns- The Corn-binns should stand on brick or stone piers about 15 inches high; this is some security against vermin getting to the corn, and will preserve the binns from decay: they are better if lined with sheet-tin or light iron plates.

Open circular Fodder Sheds, as shewn in the drawings, give better shelter to cattle than those of any other form: they ward off the wind from all points, are not subject to any violent in-current, or draught of air, which is highly detrimental to the health of stock; and a much more even temperature is preserved throughout both winter and summer. Compartments may easily be formed by division fences; this form of shed is also better adapted for the collection and preservation of the ordure dropped by the cattle, and very suitable for the hardy breeds which usually have the run of the straw-yards.

Many farmers in Scotland—also Northumberland, Durham, and other northern counties—adopt the system of confining their stock while fattening by pairs, in small sheds, with yards in front, called Hammels. The circular sheds here mentioned are admirably adapted for this purpose, all the additional expense necessary to be incurred, being that of running division fences, consisting of posts and rails, across the sheds and yards, as shewn in Plate 2. These sheds, so divided, are also best for the general live stock of the farm, as the horses can then be separated from the cattle ; and the yearlings from the two-year olds. Young horses or colts should never be confined in the same yards with oxen or cows, as they are liable to be injured by them : they also disturb the cattle by their playfulness. Not more than seven or eight should be placed in one yard.

These sheds may be supported by timber framing or columns of iron, or brick or stone piers, arched or otherwise, and the roofs may appropriately be covered with thatch. Feeding-racks, mangers, and water-troughs should be amply provided.

It is desirable to have a *Hay-house* for storing the hay required for horses and other live stock, and to be sufficiently large for holding several days' consumption; this will prevent the necessity of uncovering the ricks during wet weather. It should be placed near the cattle-sheds, and when ranging with them, the enclosing walls and roofs may be of similar materials.

The Sheep Sheds or folds should be detached; and each divided into pens of a suitable size, by means of wood or iron fences of a light character. These are necessary and convenient, both for the parting of sheep into small numbers and for handling them. No fold should be larger than about 50 feet square. Sheep-folds are very serviceable,

24

Todder Shed -

Hay House -

Sheep Sheds -

and give shelter in wet weather; and the manure may be readily collected therein—which is valuable. A sheep and lamb should be allowed 10 square feet in the fold, and a ewe about 6 square feet. A ewe requires 12 inches feeding-room at the rack, and a ram about 15 inches.

The roof may for economy be a lean-to, covered with slates, and the front supported by a framework of timber. The front of the shed should be about 4 feet high, and the building may be an open one, as sheep require merely a covering to protect them from the inclemency of the weather. The folds should be provided with racks, mangers, and water-troughs.

The Piggery should be contiguous to the steaming-house, and also near the dairy, as pigs are chiefly kept upon the food supplied from those buildings. Shelter sheds for stores may be made under the projecting roofs of either stables, or cow-houses, or in any other place if more convenient. The *area* of the piggeries may be covered with concrete to the depth of about 6 inches, and the whole well drained. The feeding yard should be paved with brick, laid in cement, with an inclination or fall from the styes. The sleeping apartment should be covered with concrete to the depth of about 6 inches, and secribed for calf-pens.

There is always an unpleasant effluvia arising from swine, which does not escape freely when close fences are used—these should, therefore, be of wood, with spaces between the pales, to allow of a free circulation of air; but in the portion appropriated for the pigs to sleep in, the division fences should be close boarded to the height of 4 feet. Brick or stone *walls* are not so suitable for the enclosure of piggeries, for the reasons just mentioned.

Sows frequently destroy their young by *over-lying*: to prevent this, wood battens 3 inches \times 2 inches should be fixed round the enclosure of the sleeping places, placed in a slanting direction, about 12 inches apart, and the bottom ends projecting about 15 inches from the enclosing walls; the young pigs can then get behind these battens, and be out of danger. Rubbing posts should be provided, also feeding troughs; the latter having cross-bars to prevent the small pigs from getting into them; the rims should incline inwards to prevent the food being washed over and wasted. Shoots should be fixed to the fences for supplying food without waste, and to prevent disturbance by entering the styes for this purpose.

A different arrangement of a piggery may be made and used with great advantage,

E.

25

Piggeriy -

when the styes are intended for fattening purposes only, and which will have some resemblance in form and disposition to cattle boxes.

Instead of having sleeping places with yards attached, it will be simply the former; these are to be placed in rows opposite each other, leaving a passage between the rows for the convenience of supplying food. Outside of each box or sty, next the passage, (but in the latter), is to be placed the feeding trough, the communication to which, from the sty, is to be through spaces left in the passage fence, which will be best formed by small iron rods fastened to a framing of wood, the top bar of the framing being part of the division fence, and the bottom bar forming the sill. The troughs should be placed close against the iron rods, which should reach about 12 inches above the top of the troughs, having sufficient space between them to allow of the pigs getting conveniently at their food : this will keep them from getting into the troughs and wasting their food, also prevent quarrelling; as each pig may have a division of the trough to itself; the troughs can be conveniently supplied from the passage ;—this plan will leave the pigs undisturbed, which is very desirable. A *small door* should be made in each sty, communicating with the passage ; also loop-holes at the opposite side for throwing out the manure into the yard. The whole can be under *one roof*, and the floors made as previously described.

The Dairy should front the north, and have a direct current of air passing through it, and the walls of considerable thickness, to protect it from damp and solar influence as much as possible. If built with stone or brick, a space for ventilation of about 2 inches should be formed up the centre of the walls, at the bottom of which airgratings should be inserted. All the window openings should be provided with framed luffer boarding; but those with glazed sashes should have the luffer framing fixed outside to act as shutters, and the glass protected by coarse wire gauze. The Milkroom should have a ceiling of lath and plaster, and the building thoroughly ventilated. Where large numbers of cows are kept for dairying purposes, there should be a milkroom, and a working room; also rooms for the storing of cheeses, churning and salting of butter, and the manufacture of cheese. The windows of the milk-room should be at least 12 inches above the trays; this will give the milk some protection from the current of air, which should pass freely but gently over it.-Agitation prevents the full quantity of cream being obtained from the milk, which should be allowed quietly to set. The windows of the cheese-room should be on a level with the floor, that the air admitted through them may pass freely around and over the cheeses placed on the floor to dry.

26

Sairy

The fittings and utensils should be of stoneware or slate, and not made either of lead or zinc; both of which metals are poisonous, and are strongly acted upon by lactic acid, which is the acid of milk produced by its fermentation.

It is frequently the practice to sink the ground floors of dairies below the surrounding surface, for the purpose of keeping the buildings cool.—This is objectionable, as it occasions dampness, which is more injurious than a small degree of warmth beyond the requisite temperature.—Dampness also favours the production of vegetable fungus or mould upon new cheeses, producing sourness and loss of weight, and sometimes giving them a fetid odour. With a sunken floor there is generally some difficulty in obtaining good drainage, which is desirable, as it gives facility for washing and cooling by evaporation. The temperature within the building may be considerably lowered in warm weather by this means, which cannot be done without extra labour, inconvenience, and expense, when the drainage is insufficient.*

The system of preserving and cooling provisions in hot weather, so extensively adopted in foreign countries, by means of ice, may be most advantageously used in dairies, as farmers in most districts have facilities of obtaining it at a trifling cost, their horses during the winter season being occasionally unemployed. To preserve ice, nothing more is required than to form a wall of clay, about 6 feet high, 3 feet thick, and lined with straw; between these walls the ice is to be stored, and then thatched over with straw, about 18 inches in thickness. A floor should be formed with loose boarding, laid hollow; upon this should be placed hurdles lined with straw, and the bottom drained by means of common perforated pipes. Ice pounded and stored in such a building will keep for years.

The Poultry House should be placed in a sequestered and sheltered spot. Poultry, when either in a state of incubation, or put up for fattening, require repose and warmth. The building should be divided into compartments; the lower portion of one being appropriated to the use of the heavy web-footed fowls; and the upper part to the large-sized gallinaceous: the others being similarly arranged for the smaller species. The area may be covered with concrete or chalk, well rammed; either of which will make a good basement. The framework of the nests should be of wood. The nests for each compartment should be arranged in tiers, up the front of that partition which will form one side of the passage; each tier having a gangway in front, about 18 inches wide for

* See No. 7, Plan of a dairy for 20 cows : and specification for the works required to be done in erecting it, together with the necessary fittings.

27

Poultry House

the larger, and nine inches wide for the smaller fowls- the roosting poles so placed as to form ladders to the several tiers : these should be oval in form. On a level with each tier, a stepping stage of deal, about six inches wide, should be laid from the roosting poles to the gangways in front of the nests, to obviate the necessity of the fowls flying up to them. A passage should be left between the compartments, as shown in the drawings, for the more conveniently getting at the several nests,-the back of each nest being provided with a small door for the removal of eggs. The external doors should have loopholes for the poultry to pass through, with slides for closing them. The rafters should be ceiled with lath and plaster, which will give additional warmth to the building. Where poultry are bred to any considerable extent, for the purposes of early production, artificial warmth is often applied to the building, by which means earlier incubation is induced, and the rearing of the young birds much facilitated. The most proper mode of effecting this is by means of a series of cast-iron pipes (traversing the several compartments), connected with a small boiler set in the centre or cooking department. Through these pipes the water, as it becomes heated, circulates freely, by the variation of its gravity. This is the most economical method of warming any building where the temperature required is moderate, and its evenness of importance. There is also no risk or injury to the fowls by their alighting upon the pipes, nor is any liability of fire incurred.

Dove Cotes have been appendages to farmsteads from the earliest ages, and though not essential or necessary, they deserve some notice under the general consideration and arrangement of farm buildings. They are sometimes placed over the doors of barns, or against some other building, but pigeons thrive best when the cote is detached and considerably elevated; they may be made conspicuous, and ornamental in appearance. This position is necessary if the number of birds kept is large, as they are then secure from cats or vermin. The crowns of the circular sheds (see plans) offer good positions for their elevation, upon which they may be built at little cost. So placed, they will form portions of the roofs to the sheds, the rafters of which will serve as bases upon which the superstructure may be raised.

The centre of the roof of each shed should be left open for convenience of access to the nests, the ascent to which may be by a ladder leading from the open space left in the shed for supplying the mangers.

The number of tiers for the nests may be as desired; but in front of each tier a

28

Dove bates_

narrow platform should be made for the birds to alight upon; also a perching rod to each hole. The roofs being conical, are best covered with zinc or thatch; and upon the apex may be placed a vane, which will be useful as well as ornamental. The eaves should project sufficiently to give good shelter to the nests, and the whole (with the exception of the vane) painted white.

The Slaughter-house should have a cool and airy situation. If the farm is small, this building may also be used as a steaming or brewing-house, and separate erections for these purposes dispensed with.

In some cases, it may be either necessary or desirable to have a building answering this purpose, especially if the homestead be distant two or three miles from a town or village. Where much live stock is kept, considerable loss is sometimes occasioned by casualties (such as the breaking of a limb), which may render instant slaughter necessary, so that the greatest value may be obtained for the carcase; for such purpose alone, a building of this description will be found of great advantage. It is also a convenience for the killing of sheep or pigs in, for home consumption. Some farmers slaughter their cattle and send the carcases to market; and as railways offer great facilities for this purpose, it is desirable to have the option of so doing, particularly as the cost of erection is small. The slaughter-house will also furnish much valuable manure, the whole of the blood and refuse being collected.

The walls of this building should be erected with solid materials, to the height of 4 or 5 feet, and may then be completed with framed timber luffer boards; the floor to be paved with brick or stone, and provided with sunken channels, gratings, syphon traps, and drain pipes, leading to one of the manure tanks in the yards. The necessary fittings and utensils, are a boiler, pump, sink, deal stool, short step-ladder, and deal table; also hoisting tackle fixed to strong timber framing in the roof. The building should have a northern aspect.

The Steaming-house should be placed in the vicinity of the cattle sheds and piggery; where a large number of pigs are kept, it should be surrounded by the piggery. An efficient although simple apparatus for steaming food is shown in plate 2.

A blacksmith's and carpenter's shop is indispensable on all farms, especially when distant from a town or village. They are of great convenience for the repairs of waggons, ploughs, and the various implements ; and save much time and delay, occasioned by having to send backwards and forwards to a distance ; nor is it necessary, on a small

Steaming House -

Maughter

House -

farm that a man of either calling should form a part of the establishment, as they are equally useful, for the convenience of the village artisan when required, and for the working up of materials, which should always be kept in store. On small steadings, one building may be made subservient to both purposes; it being provided with a small forge and bellows, anvil, vice-bench, and a few tools; also a carpenter's bench, stools, and some other necessaries. Outside the building should be a place for the ringing of wheels, and a small yard for depositing materials and the articles undergoing repairs.

When the farm is large, they should be distinct from each other, and fitted up rather more efficiently—especially the carpenter's shop—as all the wheelwright's work can most economically be done at home. If on an estate where much timber is grown, and a steam-engine employed, the latter building will be more advantageous if placed near the engine-house, as a small saw-mill can be attached, and the power profitably used in cutting planks, boards, and quartering.

The building may be a lean-to, roofed with slates or tiles, having the back enclosed, with a doorway in the centre; the front, semi-enclosed or open to the yard; the floor of concrete or chalk, well rammed.

Fences for the enclosure of yards within the steading, should be of a light, but substantial character. Those enclosing the *fodder yards* may be of fir, except the posts, which should be of oak; but fir may be used for these if they are charred at the bottom ends, and well saturated with coal tar before they are fixed in the ground; that part above the ground should be planed, and painted white (or tarred). The distance between the posts should not exceed 8 feet. To complete the fence, the posts should be connected by three arris rails, and the paling "hopped;" that is, one long one and one short one placed alternately; the lower division will thus be nearly close, for the purpose of keeping in or out small animals, and the upper division comparatively open. The rails should be "arris rails;" that is, the timber cut diagonally lengthwise; they are cheapest when formed in this manner, and are but little injured by rain. The rails and palings may be either tarred or painted; if the latter, the wood will require to be planed. A patent marine glue has been used for fencing instead of paint, but it does not stand the action of the sun, and is expensive. The proper height for these fences is about 4 feet 6 inches. Those shown in the plates are cheap and appropriate.

The external boundary of the steading (see plate No. 1) will be chiefly formed by the back walls of the several buildings, which gives the best possible enclosure. Those

30

Jences -

parts to which the buildings do not extend, should be enclosed either with a substantial wall with coping, (which will serve for the back wall of future erections when required), or a close boarded fence of cleft oak or fir. The entrances are best enclosed with folding gates, which should correspond with that part of the enclosure in which they are placed.

The Gates to the principal front may be of iron, which is ornamental, and that fates - part of the enclosure a light iron fence on a dwarf wall. All gates should be hung with strong hinges, having counter sinks working upon centres, which should be of steel.

The *Gate-posts* should be of oak where the fence is boarded; but if the entrance is between buildings, or through an opening in the walls, the quoins or piers against which the gates are to be hung, should have stone bases and pier-stones for that purpose.

Hanging Gates should be made strongest at that end from which they are suspended, and tapering towards the opposite; having strong diagonal braces leading from the bottom of the hanging style to the under side of the top bar at the other end; this will support the gate, and relieve the post from the great strain to which it would otherwise be subjected. When the bearing is long, they have a tendency to sink at the head; to avoid which, a circular plate of iron, about 14 inches diameter, should be laid down and fastened by screw pins into stone bases, about three inches of the plate being let into the hanging post. Attached to the bottom bar of the gate a small wheel should be fixed, and made to traverse the circular disc; this will support the gate, and relieve the post from a great portion of the weight of the gate.

All the buildings of a business character, which are required to form a good and complete working homestead, have now been enumerated and amplified, and sufficient information given to enable any person conversant with the requirements of a farm to erect and adapt them to their various purposes. There are doubtless some minor points which may appear to have escaped attention; but the general description of a building, which includes the best mode of erection, the selection of materials, and the practical application of its intent, should be compressed and made as concise as possible; that the attention may be fixed upon its leading features and utility. To this the author has adhered throughout, being more anxious that every observation should have a plain and practical bearing of some importance, rather than encumbered with minutiæ of description. The *specifications* will supply all such apparent omissions, and be found copious in their details.

On the subject of Steam Power and Machinery, it may have been expected that more would have been stated under the consideration of the machine-house; but the application of steam as a source of power, is more properly connected with farming operations than with the arrangement and designing of buildings best suited for the homestead; and any observations upon its application (which can only be general), will appear more in place at the conclusion than in the body of this book, and would have interfered with the course proposed at the commencement—that of considering the buildings seriatim with their several uses.

As a general remark, where machinery is employed to any considerable extent (and in the absence of a mill-stream), a steam-engine should be erected. This is undoubtedly the most economical source of power, and can be made subservient to many purposes; besides, it has this advantage over horses—that of never tiring; nor will its application interfere in any way with the arrangement of the buildings as planned. It will only be necessary to convert the track-shed into an engine-house—the position for which will be the same.

The application of steam power on farms is yet in its infancy; and it is objected to by many, that for the purpose of small farms, it is unnecessary and expensive,—but on those consisting of 800 to 1,000 acres or upwards, it is recommended. The number of operations that can be so readily performed at one time with the aid of proper machinery the great dispatch—the amount of work that can be accomplished—and the small cost of the sustaining power, being only that of a few bushels of coals per diem, are facts too important not to attract the attention of every scientific farmer.

It remains only to be observed in conclusion, that as all farms do not require the same description of buildings, or amount of accommodation, and that the choice of site or other local circumstance may warrant some alteration in the general disposition of the homestead as designed, it is necessary before proceeding, that the several requirements should be fully considered, and the whole laid down and shown in comprehensive plans; which can only be done by-an experienced surveyor, and one who is well versed in agriculture.

ESSAY II.

ON

COTTAGES FOR LABOURERS.

DURING the progress of civilization, the relative position of the various grades of society has never obtained that just and liberal consideration, which it is now receiving from all enlightened and philanthropic minds. Rich and poor, in our social welfare, form but one chain, composed of larger and lesser links; which while they hold kindly together, the general good progresses with harmony. Under this system of economy, the employer and the employed are bound by mutual and reciprocal ties.

No operation of any magnitude can be performed by one man alone; whether it be in the cultivation of land, or the establishment of a factory, he requires the assistance of his fellow-men; and it is only by mutual concurrence that the purposes of life can be carried out with profit and advantage. This also implies some demand upon our moral duties. The mere payment of wages will neither ensure fidelity, nor produce that respect so gratifying to our feelings; the labourer must feel that his interest is not wholly immerged in that of his employer, but that in return for the sweat of his brow, he shall receive some consideration beyond the pecuniary engagement entered into.

There is no way more calculated to produce this desirable feeling, than by making his home healthy, comfortable and convenient; this is the first and most important step in the improvement of his moral and social condition; and it is a source of much pleasure to find a disposition on the part of our landed proprietors to carry into effect this great desideratum.

The purpose of the following Essay, is to shew that cottages may be so constructed, as to afford every necessary comfort to the labourer,— to better his condition both physically and morally; and, at the same time, to yield a remunerative return upon the capital invested.

F

The accommodation required is not such as would be looked for by persons moving in a higher sphere of life, and who are accustomed, comparatively, to luxuries; the labourer belongs to a totally distinct class of society, and what he most requires are warm, comfortable, and well-ventilated apartments. Let the dwellings of the poor be scientifically constructed, and much illness and misery will be prevented. In effecting this the whole community is interested, as parochial expenses are increased or diminished according to the healthy state of the labouring population.

Cottages should be warm, and substantial: judgment will also be displayed when the architectural character of the building is in harmony with its use. Their exteriors may be made exceedingly ornate by the application of a correct taste, which does not necessarily create much expense; and although ornament is not a necessary appendage to stability or comfort, it frequently happens that ornamental buildings are preferred, and when judiciously disposed, will materially assist in heightening the landscape. It then becomes a question with the owner of an estate whether he will, in the erection of cottages, incur a small additional outlay for this purpose.

England has justly been designated a cultivated garden; and perhaps in no particular possesses a greater pre-eminence of appearance over other countries, than in the beauty of her rural scenery; which, it is submitted, may be greatly enhanced by the substitution of cottages erected in accordance with architectural principles, in lieu of the clumsy-looking, and comfortless buildings, existing in many districts.

The picturesque appearance of the cottage may be increased by entrance porches, overhanging roofs, and stacks of chimney shafts, having ornamental summits. The porch, independently of its architectural effect, affords both warmth and shelter, as does also the overhanging roof. The lofty chimney clustered shafts, besides assisting to prevent a smoky room, have a very pleasing appearance.

The taste for the beautiful, which formerly was confined exclusively to the upper and middle classes of society, is now partially extending to the labourer. Scarcely a cottage can be entered, but some works of art (if only a common engraving,) will be found within it, which, a generation or two since, would have been considered good enough for the apartments of the upper classes.

The contemplation of such objects has a powerful effect upon uncultivated minds; creating inquiry, promoting an improved taste, and enlarging the intellect. The more the minds of the lower orders are enlightened, the more will they be impressed

with the sacredness of the rights of property, and the obligations of society. Facilitate the opportunity of the labourer for obtaining comforts, and the means of rational enjoyment, and you will create in him a relish for his frugal and homely fare, and furnish him with the means of happiness in his home and family.

To each cottage a garden should be attached of not less (nor much larger) than one-eighth of an acre, which is infinitely preferable to distant and more extensive allotments. This will enable the cottager to raise vegetables sufficient for the use of himself and family; furnish employment for his leisure hours; create an additional interest in his home; and tend towards keeping him from the beer-house. The good that will result from this may be further increased, by the landlord supplying the labourer with artificial or other manure for his garden, which should be paid for by instalments. The manner in which he cultivates his plot of ground will give his employer an opportunity of judging of his habits of industry.

The garden allotment^{*} system has had a beneficial effect, in general, upon the character of the labourer; many, who previous to their possessing allotments, were idle and dissolute, have since become much better members of society; showing the great influence that an occupation, combined with a stimulus of profit, has in inducing habits of morality.

It has been supposed that by the concession of a plot of ground as a garden, that the energies of the labourer may be so exhausted in its cultivation, as to be prejudicial to the interests of his employer; and that this additional work having to be done in his leisure, may render him incapable of properly performing his daily work, and induce him to spend some part of that time in rest, which belongs to his master. If an isolated

* In the neighbourhood of the Author, the most beneficial results have been produced from this system, through the kind consideration of a gentleman who is ever foremost to promote the welfare of his poorer fellow-creatures. Several who hold some of the allotments here alluded to would have been compelled, from want of employment, to have sought relief from the parish authorities, had they not have found subsistence from this means.

I here take the liberty to digress from the immediate object of this Essay, to state that, from the difficulty of access to land where allotments are sometimes placed, and the inability oftentimes of labourers to obtain manure for their patches of ground (which, if constantly cropped without it, would become sterile), if artificial manure was procured by the proprietor, and sold to the labourer, the former would do an act of kindness, and the latter be benefited by the act; and this without risk, as the improved state of cultivation, and the crops upon the land, would be security for payment.

case can be quoted to countenance this supposition, such is not the general disposition of our nature—kindness and commiseration will produce more from man than the whip of slavery; and our free-born, independent peasantry have too much sensibility and generous feeling, not to appreciate the distinction—and that most justly. Give the poorest creature some prospect that he may realize by his exertion a state of comfort for his family, and you anew create him—supply him with the means of making that condition permanent, and you attach him to you with feelings of gratitude; which education—the precepts of religion, and, above all, the feelings of a heart acted upon by sympathy, will stimulate him to return by the only means in his power—his labour and fidelity.

It may here be observed, that the position of the farm-labourer, as regards his future chance of advancement in life, is unfavourable when compared with that of the artisan, who, by the possession of superior skill in his particular occupation, has the prospect, by exertion and economy, of eventually working himself up step by step, until he becomes a master; and finally the possessor of wealth. Of this we have many instances, and deservedly so; but from all such hope of advancement, the agricultural labourer is almost entirely cut off. The amount of capital required for the profitable tillage of land is an insuperable difficulty : he can rarely by any exertion of his own change his condition, but must remain the same through life, in that position which it has pleased Providence to place him. The least, then, that can be done for those that are deserving, is to give them every facility of providing the necessaries of life, and to endeavour to make them happy and contented in their station.

A sty being attached would afford an opportunity of keeping a pig, for consuming the refuse of the garden, and other waste, and would furnish the cottager with solid food at a cheap rate.

If a few cottages were erected near the homesteads of farms, a speedy assistance in cases of fire or accident could be obtained, and would afford protection against depredators. An additional reason for thus placing them, is the great distance labourers frequently have to walk to and from their work; and it is obvious, that when they have to walk several miles daily, for such purpose, they are less able to perform a given quantity of labour in a stated time—they moreover have less time for rest.

The only means possessed by the labourer of obtaining privacy during the hours of leisure, is in his cottage; and as there are many humble duties which can best be performed in private, it is important that the cottages should be detached, or semi-

detached buildings; but as the cost is considerably increased when singly placed, and not so warm as when in connection with another, the most preferable manner of building them is in pairs.

Previously to erecting any building intended for a dwelling-house, one most important consideration is the *site*. A light, gravelly substrata is preferable, on account of its porosity ensuring a rapid filtration, and drainage of surface-water. Heavy clayey soils, from their argillaceous nature, retain water for a considerable period; imparting dampness to buildings, and rendering them unwholesome for habitation. A low, marshy soil, is above all others to be avoided; for, independently of the miasma arising from its surface, there is a continual dampness in the atmosphere which communicates itself to all objects surrounded by it. It is now generally acknowledged, that this noxious vapour is in reality a deadly poison, which acts upon the human system through the medium of the lungs, producing fevers and other epidemics. The next consideration is to ensure good drainage; which is essential, and may generally be obtained at a small cost. The common earthenware pipes, of an oval or egg-shaped form, about 5 in. by $2\frac{1}{2}$ in. at bottom, are sufficiently capacious to carry off the drainage from a cottage; they are not so costly as brick-drains, and are more efficient.

All drains should be trapped with a syphon trap, so as to prevent the escape of foul air, and the admission of vermin to the dwelling. The drains should communicate with a cesspool sunk in the garden, domed over with brick, having a stone man-hole or flap to enable the cottager to repair or cleanse it; or to avail himself of its contents for manuring his garden. A drain should also lead from the sink in the scullery to the cesspool (trapped as before described), and this should be so arranged as to carry off the water used for washing the floors, when they are of stone, brick, or composition. The cheapest and best form for the cesspool is that of a parallelogram, about 5 ft. long, 2 ft. 6 in. wide, and 3 ft. 6 in. deep.

The facility of obtaining an abundant and wholesome supply of water is important ; the health of a family being greatly dependent upon the nature of the water consumed. If the supply is intended for a large number of cottages, a reservoir might be constructed on a height, should that be practicable, and the water brought from thence in pipes. If for a small number, good water may generally be obtained in sufficient quantity, from wells properly sunk, and constructed with barrel-kirbs to prevent the earth falling in ; the kirbs being filled in with brick-work laid without mortar ; the tops arched over

having stone man-holes, as described for cesspools; and a small hole for the insertion of the suction-pipe of the pump.

When there is a difficulty of obtaining water (which is often the case in chalky districts), the method proposed in the *Essay on Farm Buildings*, for the collection of rain-water, may be adopted. The cisterns for this purpose should be covered over, and provided with overflow pipes, inserted about 2 inches below the top, and taps for drawing off the water.

Where practicable, the cottages should have a south or south-easterly aspect, the most wholesome one being the south-east, on account of the wind blowing less frequently from that quarter, and from the general mildness of its character. When so placed, each side of the building will have the benefit of the sun throughout the greater portion of the year, which is desirable, as it will prevent dampness in the walls; it is also the most cheerful and pleasant to the inmates.

The *Materials* to be used in the erection of cottages, will generally be those found in the locality in which they are to be built. Where fir abounds, as in the north of Scotland, this timber may be used both for boarding and scantling; in places yielding stone,---that material, with flag-stones, for roofing. But where stone or timber is scarce, and bricks available, they are preferable for the construction of the main fabric; for this purpose, clay alone is frequently used; and in some counties, clay lumps partly dried in the sun.

In the south and west of Lancashire, houses are in existence built with a framework of wood, filled up with wattled shed-work, and covered with a composition of clay and wet straw, locally called "clot and clay," which, when plastered and lime-whited, have a neat appearance. Walls of a similar character are also used in Devonshire, called "cob-walls," and in France, *pisé*. There are houses in the department of the Isère, Rhone, and Din, which have been built upwards of a century, the walls of which are formed with this material, and which effectually resist the inclemency of the weather. This description of wall is stated to have been used by the Romans; also in the lofty watch-towers in Spain; and although the atmosphere of these countries is not so humid as that of England, still clay may be advantageously used here, if properly prepared, and applied with judgment.

These walls may be formed with any argillaceous earth; but strong clay is the best, which should be well tempered, and mixed with a portion of fine gravel or sand.

This facilitates the drying, and prevents it from cracking or excessive shrinking. In forming walls of this material, two rows of poles, parallel to each other, should be fixed temporarily in the ground, and planked on the inner sides, leaving a space of about 20 inches between for the thickness of the wall; the prepared clay must be well rammed, and the planks raised as the work proceeds. Iron hooping should be laid diagonally in the substance of the walls, as bond; and care taken that the walls are erected perpendicularly.

Over all the openings stout lintels should be laid; and the door and windowrames fixed as the work progresses. When the walls have sufficiently set (or dried), the planks and poles may be removed; these will serve as timber for joists and rafters. After the walls are completed and thoroughly dry, a coating of plaster may be laid on the interior, and the exterior rough-casted, which will prevent the penetration of the weather. An additional means of keeping these walls dry, is by simply ventilating them with small perforated earthenware (drain) pipes; which should be built at intervals, in the substance of the walls, and reaching from the bottom to the top; the bottom resting upon a framed opening, defended by a cast-iron air-brick; and the top having a small orifice under the eaves leading outwards; through these pipes, all moisture exuding from the walls will be carried off by the current of air passing upwards through them.*

Plain or ornamental *tiles* are a good material for the coating of walls on their exterior; they are very durable, and effectually keep out the weather. This description of coating is equally applicable to walls, whether constructed with framed timber, or formed with clay as above described.

The *foundations* may be cheaply and efficiently formed with concrete, to within a few inches of the adjoining surface; and on this the footings, of brick or stone, on the top of which (but above the ground) should be laid a course of slate, to prevent dampness rising up the walls by capillary attraction.

When bricks are used for walls, they should be laid on edge, as they require a much less number used in this manner than if laid flat. A space of about two inches should be left in the centre of the walls, to prevent dampness passing through them. Air bricks should also be inserted, as before described. The piers for supporting

* These walls may be advantageously used for most farm buildings, and are probably the most economical mode of construction that can be selected.

girders which have to carry heavy weights, may be made solid, by filling up the vacuity with broken bricks or small stone.

Concrete has been used for walls, and found to answer; but as it has to be plastered, both on the interior and exterior, and requires great care in moulding, it is not recommended; particularly as the cost of the materials, together with the necessary framework and boarding, will be nearly equal to that of bricks or stone, especially if the latter can be obtained in the locality; and which are undoubtedly the best and most durable for cottage walls.

Timber-built Cottages harbour vermin; are less durable than those constructed with brick or stone; and more liable than either to take fire. By bricking up the spaces between the timbers, the harbour for vermin will be destroyed, the danger from fire lessened, and greater warmth obtained; but the cost is then nearly as great as if bricks were used entirely, and this without the advantages attached to them.

Partition walls should always be built with solid and incombustible materials (where practicable), for the prevention of danger from fire; particularly staircase enclosures, which are the chief, if not the only means of escape from the upper portion of the dwelling.

The *Stairs* should be formed of iron, stone, or slate; if either of the two latter are used, they should have a lodgment on dwarf walls. In cases of fire, hollow timber partitions are frequently the cause of the total destruction of the building; their combustible nature offering no check to its ravages, and sometimes, from this circumstance, exposing the inmates to imminent danger. Where expense, or other circumstances, preclude the use of brick, the interstices of the timber partitions may be filled up with concrete, or clay mixed with a small quantity of lime.

The various descriptions of *roofing* are described in the previous Essay, and which are equally applicable to cottages as to farm buildings. See Page 8

By giving a sharp pitch or angle to the roof, a less lateral thrust is exerted against the walls, and greater security is obtained from the effects of wind and rain. The steepness of the roof also gives more room beneath the rafters, and affords an opportunity of making, at a small cost, convenient sleeping-rooms within its span.

Gutters, and pipes for conducting the rain-water from off the roofs, should never be omitted; if the rain is allowed to trickle down and saturate the walls and foundations, constant dampness is the result. They may be formed with wood, zinc, or iron. The

gutters should be laid with a fall of about one inch to every ten feet; and the descending pipes provided with cistern-heads. The bottom joints of the descending pipes are best of iron, as from their position they are most liable to injury. The water may be conducted to tanks sunk in the ground, or to cisterns placed for this purpose; and then filtered, in the simple and almost inexpensive manner as described in Essay on Farm Buildings (Page 4), which will render it fit for domestic use.

Floors should be formed of such materials that they may be free from damp, easily cleansed, and when wetted, will not remain long in that state. Very dry and comfortable floors may be formed by covering the area of the rooms with a level stratum of concrete, consisting of dry screened gravel or pounded stone, mixed with a small quantity of ground stone lime, or Portland cement, and laid about 6 inches in thickness; over this, and before it sets, should be sifted a few ashes, or some fine gravel; which, if worked in and well finished, gives a hard and even surface. This description of floor is similar to those used in Devonshire, which are proverbial for comfort and durability.*

Similar floors may be made with a mixture of clay and chalk, instead of cement; but these require a long time to harden. The ordinary red paving tiles, 12 in. square, make very good dry and comfortable floors, which can be easily kept clean.

Three SLEEPING-ROOMS should always be provided in each cottage, as that important desideratum, a division of sexes, is thereby insured. Sleeping-rooms may be on the ground-floor, but they are undoubtedly best placed in the roof (as proposed), as they then possess the most privacy; and are more effectually protected from damp and draughts. The height of these rooms should not be less than 8 feet.

Objections have been made to so many rooms in labourers' cottages, considering they offer a temptation to the occupants to take in lodgers; this may be remedied by arrangement, the landlord keeping over them a sufficient control.

A constant and ample *supply* of *fresh air* to every apartment of a dwelling, is absolutely necessary for preserving health. This is forcibly illustrated by Dr. Arnott, who states, "If a canary-bird be suspended within and near the top of a curtained

^{*} The patent artificial stone, manufactured by Messrs. Ransome and Parsons, of Ipswich, an account of which was read at the Institution of Civil Engineers, in January last (and to whom the silver Telford medal was awarded), appears to be a most excellent material for such purposes, and deserves to be tried.

G

bedstead, in which people are sleeping, it will generally be found dead in the morning." Pure air has a very powerful effect on our mental and physical functions; it braces and gives vigour to the whole nervous system; by which healthy influence the body is not only capable of far greater exertion, but the mind is equally invigorated; it becomes more expansive; and renders man capable of far greater mental enjoyment.

If apartments are not properly ventilated, the air soon becomes impure, and cannot fail to operate prejudicially to the health of those who inhale it. To give some notion of the large quantity required for the healthful occupation of a dwelling, it will only be necessary to state that a healthy man respires about twenty times per minute : in that period he inhales about 700 cubic inches of air, and by respiration vitiates about 1,630 cubic inches ; to say nothing of the exhalation from the skin.

In rooms occupied during the day, fresh air finds its way through the crevices of doors and windows; and as these are frequently opened and shut, the atmosphere of the rooms is by this means renovated sufficiently; but the only means of escape for exhausted or vitiated air, generally speaking, is that which the chimney affords.

In sleeping-rooms, a more systematic mode of ventilation is required; as these rooms are used at night, when all doors and windows are closed; and, to further impede this necessary process, it often happens that these apartments are constructed without chimney openings. Where this is the case, a small air-flue can be made by the side of the chimney (and which will presently be described), on a corbelling, projected from the wall just under the ceiling, placing a covering of wire-gauze over the opening at bottom. This flue may be carried through the roof in the shape of a pinnacle, as shewn in plate 15. The door of each room should have inserted in it a perforated zinc panel near the floor; which will admit a constant and gentle supply of fresh air.

Air, when vitiated by respiration or heat, expands; and from its specific gravity becoming lighter, ascends. Now, if at an opening near the floor of the apartment, pure air be admitted, the specific gravity of which being greater than that of air so vitiated, it will displace the latter: and if means of escape be given by another opening at the ceiling, the natural laws which govern the movement of this body, will induce a perpetual change; and prevent that contamination which is so injurious to health. Should the lower opening be diffused by extending it along the skirting, and wire gauze or perforated zinc be placed over the outer opening in the wall; or self-acting valves so arranged that they may act with facility, and according to the circumstances of the moment; the current of air when

so admitted will be mild and equal, and but little liable to strike upon the person so as to cause an offensive or injurious draught. If the upper opening leads into a flue adjoining the chimney, the action of the air will be more certain and uniform, than if made in the wall near the ceiling; nor will it be subject to the influence of windy weather. Or the flue may be made to discharge the air into the roof, instead of passing through it : a cast iron self-acting valve should then be inserted in each gable, for the dispersion of the vitiated air so conducted. By the adoption of either of these simple means, the ventilation will be sufficiently perfect for any description of cottage, and may be effected at a mere nominal cost.

As the occupation of the agricultural labourer necessarily exposes him to all sorts of weather, it is questionable if he would be benefited by having his dwelling warmed by pipes, or any artificial, although scientific means, independently of the expense of doing so; yet the following simple plan, imparted to me through the favour of R. A. Slaney, Esq., M.P., and inserted at foot of page, seems an exception, and is worthy of consideration.*

Water-closets should be contiguous to, and if built against the walls of the cottages, entered from the outside only. The seats should be provided with common glazed stone-ware pans (which may be purchased for 7s. 6d.), and glazed pipes should convey the soil to the cesspools; these should be sunk outside the closets. This arrangement will prevent the escape of much noxious effluvia within. The roofs of the closets should also furnish the means of ventilation.

As a general remark on the construction of cottages, it may be observed, that a square building requires less walling for its enclosure than any parallelogram, the area of which is equal; and the greater the deviation from a square, the more walling will be

* "In building the cottage, the floor of which should be a little above the surface of the adjoining ground, lay some common drain pipes of an inch or two diameter under the floor, communicating at one end with the outer air through the wall; the other end leading into a warm air-chamber built at the back of the grate generally used, either separated from it by an air-tight strong iron plate, or by good brickwork : from the top of the air-chamber leave in the work a small flue, open up the wall at the back of chimney, (but separated safely from it, lest smoke enter). From this flue a communication may be made with any room or rooms above, where you may conveniently form a small opening, and the air warmed in the airchamber will constantly come out. It might also be carried to a cupboard or closet to dry clothes, or thrown into a second floor or elsewhere."

required; a square possessing greater available space than any figure, the outer lines of which are equal. It follows, therefore, that a *double* cottage, having four rooms on a floor, two back and two front (which will nearly form a square), will require less brickwork in the construction of the walls, than if arranged as two single houses. Also as regards the roofing; if the buildings are covered with double spanned roofs, the space within will be valueless; but if the double cottage is under a roof having a single span, the space within is available; and in which, if the walls are carried three or four feet above the ceilings of the ground-floor rooms; good and commodious bed-rooms may be arranged. Under this arrangement, the quantity of roofing is not greater, and the expense and inconvenience of lead gutters, which are required for a double spanned roof, avoided. *Lead gutters* are not only expensive to construct, but are liable to overflow from obstruction; and frequently, from this circumstance, occasion considerable damage to buildings.

Independently of cottages being well ventilated, warm, and convenient, much additional comfort may be given in the interior arrangements; each room being provided with necessary, appropriate, and convenient fittings, closets, &c., which are best provided by the landlord.

The bed-rooms should all be furnished with closets, shelves, and hat-rails; one room, at least, should have a stove fixed in it, which will be of great comfort and convenience, in cases of sickness.

Instead of the cottager finding his own bedsteads, it is suggested that the landlords should take this matter into their own hands; when the property of the cottager, they are frequently old crazy articles,—and sometimes he does not possess even these, but is obliged to lie with or without a mattress on the floor, which encourages slovenly habits and uncleanliness. Iron bedsteads may be purchased for ten or twelve shillings each, which occupy but little room, are ornamental in appearance, and comfortable in their use.

The *kitchen*, or dwelling-room, should be furnished with a *fire-grate* or *range*, suitable for cooking and other purposes; in which particular, there is much room for improvement. All inventions intended to be used in common cottages, whether for promoting comfort, or additional convenience, should be simple in character; and self-acting, as much as possible.

The kitchen ranges sold by ironmongers are expensive, and, from their com-

plicated forms, not well adapted for cottage use; if fitted with boilers, they soon become cracked, from carelessness; and if with ovens, they are seldom used (even if they act well), from their requiring a large quantity of fuel to render them effective in baking.

A simple, cheap, and efficient stove or range, with oven, may be constructed at a very trifling cost, and free from the above objections; the whole being formed in brickwork, excepting the fire-grate and oven. The fire-place will be formed in brickwork, having only a framework of four iron bars for its front, and about the same number also for its bottom, so made that it may be conveniently fixed: the cheeks to be of fire-lumps, and the back formed by the oven; having a shielding of fire-tiles in its front. The oven is to be placed upon fire-tiles two inches in thickness, and elevated above the bottom of the grate to allow sufficient draught for the fire to pass under, and which will ascend at the back up a flue leading to the upper part of the chimney; the smoke ascending in front, in the ordinary manner up the chimney. The oven will thus be surrounded by heat, and constantly hot, without the consumption of additional fuel. The door of the oven will be on one side of the chimney jaumb, an opening being made in the brickwork for this purpose. The ascending flue at back of the oven must have a damper, for the regulation of the heat: a small fire will thus suffice for the purpose of cooking or baking. The oven may also be used for the heating of broths or stews. The whole arrangement is simple and economical in construction, and will appear more plain upon reference to the drawings. See plate 16.

Ash pits should be provided to all kitchen ranges, for the economy of fuel, and avoidance of danger from fire; they also prevent much dust flying about the rooms, and promote cleanliness. They are easily formed, by sinking in the hearth a small pit (equal in size to the bottom of the grate), the top of the pit being covered with an iron grating or perforated plate.

A deal DRESSER with drawers and shelves is necessary in every kitchen: it is not only of great convenience, but gives this apartment an appearance of neatness.

The SCULLERY should have a sink, and a supply of water, if possible; a plate-rack over the sink, and one or two shelves for placing saucepans on them. A small galvanized iron pan, of about twelve gallons, should be set in this compartment,—this will be of great advantage to the cottager for washing or other purposes.

The utensils and fittings above enumerated, are all that are deemed essential or necessary to be provided by the landlord, and which may be considered as a part of the

cottage, and should therefore be included in any estimate of cost for erection; all the minor fittings may be left to the occupant.

The description of the necessary fittings for cottage use completes this Essay, in which, the author hopes he has fully established both the advantage and necessity of giving every domestic comfort to the labourer, compatible with his station; and that the improvement of his domicile, conjoined with the profitable culture of his garden, will be found the certain means of raising him in the scale of our industrious classes, and of greatly improving his moral character. At the same time, due regard has been given to the cost of erections, and that cottages built upon the plans proposed may yield a reasonable remuneration.

In surveying the state of the population of our agricultural districts, it will be generally observed, that the condition of the farm labourer is inferior to that of the mechanic, both as regards education and domestic comfort. This has already seriously engaged the attention of many benevolent landowners, who are strenuously endeavouring, not only to ameliorate that condition, but, by permanent improvement, to establish such a system of domestic economy, as will gradually and surely induce a feeling of morality, and which will always be accompanied with settled habits of industry. These, conjointly, cannot fail of making that alteration in the character of our peasantry so devoutly wished. Moral and industrious habits once established, the mind becomes softened and influenced by a more elevated feeling; and is then prepared to receive instruction from the schoolmaster or the divine. The blessings thus conferred will be lasting; and the benefit that will accrue to the rising generation be beyond calculations; the habits of children being naturally biassed by those of their parents, and receiving from them their first impressions, whether for good or evil.

If, in this Essay, the author has furnished such suggestions as will promote that good work—"the improvement of our agricultural population"—it will to him be a lasting gratification. His desire is, that his labour may tend to that great end; and, as such, be accepted by his august Patron, and those Noblemen and Gentlemen who have kindly given him their countenance and support.





CONDITIONS TO ACCOMPANY SPECIFICATIONS.

THE WORD CONTRACTOR TO APPLY ALSO TO CONTRACTORS.

THE several works are to be done in a sound and workmanlike manner with good and suitable materials, according to the drawings herewith exhibited, together with the figured dimensions and written explanations upon them, and to the entire satisfaction of the Architect employed to superintend the works.

The drawings, figured dimensions, and written explanations to be equally binding with the specification; and if anything should have been omitted which may be considered necessary by the Architect, as essential to the stability or proper performance of the works intended to be done, it is to be executed without any additional cost or charge.

If at any time any unsound or improper materials should be used in the works, or should they be proceeded with contrary to the directions of the Architect or his Clerk, he is hereby empowered to require the Contractor to cause the same to be removed (or altered), and substitute proper materials in their stead; and the Contractor shall forthwith pay every charge or cost that may be incurred in so doing.

No alterations in the drawings shall vitiate the contract; but all alterations, either by additions to, or deductions from, the contract, are to be valued by the Architect, according to the schedule of prices which shall accompany the tender for executing the several works.

The Contractor to be responsible for all defects that may arise from the use of improper materials or workmanship, or accidents by fire or otherwise, and to make good the same at his own cost; and if not made good, or attended to, within fourteen days from the time of occurrence, the Architect is hereby empowered to employ other workmen to remedy any, and every defect, and deduct the amount of expense incurred from money that may be due to the Contractor, provided he gives the Contractor, his clerk, foreman, or workman, seven days' notice in writing of his intention of so doing.

The Contractor to complete the whole of the works within months from the date hereof, and to insure the buildings, in an approved assurance office, for the sum of \pounds

H
as soon as they are covered in; or the Architect or owner is hereby empowered to insure them and deduct the expense of so doing from the amount of the contract. The Contractor is also to find, at his own expense, all scaffolding, materials, labour, and every other necessary, for the proper performance of the works.

Should a cessation of operations take place, from any cause whatever, without the consent of the Architect, he is hereby empowered, without giving notice to the Contractor, to employ workmen to complete the works, and deduct the expense incurred from money that may be due to the Contractor.

The amount of the contract to be advanced at the rate of £75 per cent. on the value of the works executed. Three advances to be made prior to the completion of the contract; the remainder to be paid after the accounts have been adjusted, the fines (if any) being first deducted therefrom.

SPECIFICATION.

EXCAVATOR.

Dig out the earth for all drains, tanks, cesspools, foundations, wells, and posts. The trenches to be nine inches wider than the footings, and filled to within nine inches of the adjoining surface with concrete, to be composed of ground stone lime and clean gravel or broken stone, in the proportion of one of lime to six of gravel.

The site of the buildings and the yards to be levelled, and to have inclines or falls as shown in drawings by dotted lines. The roads to be covered with gravel twelve inches in thickness.

BRICKLAYER.

The bricks to be sound, hard, square, and well burnt stocks; those used for external work being of a uniform color.

The mortar to be composed of one part of approved lime, mixed with three parts of clean sharp sand or sifted gravel.

The wells to have barrel kirbs, built in 4½ in. brickwork, steened and arched over, with stone man-holes fixed in the crown of the brickwork.

The cesspools and tanks to be built in 9 in. work carried up in cement, and afterwards coated with the same material. The bases to be formed with one course of bricks and three of plain tiles, well bedded in cement, so laid that they break joint. If the soil is porous, a space behind the walls should be well rammed (or puddled) with clay.*

* When slate or iron is used this process is not necessary.

ü

The main drain running across the steading, to be of glazed earthenware about 18 in. deep, and oval or egg-shaped. The surface drains, and those leading from the cattle sheds and stables to the manure tanks, to be 6 in. deep, of similar material and form. Junctions to be made where required, and all the drains to be properly trapped with syphon traps..

The walls to have three course of footings, with a course of slate laid over them, carried up to the necessary heights, worked in sound and regular bond,—the mortar spread equally throughout and neatly pointed;—the whole being made truly level, straight, and perpendicular. No four course of bricks to exceed $11\frac{1}{2}$ in. in height,— $1\frac{1}{4}$ in. iron hooping to be inserted at every eighth course in height. Cast iron air bricks to be inserted a few inches above the adjoining surface, placed 12 ft. apart; also at the top of the walls. Oak bricks to be inserted to all door and window openings; also for skirting. A space of 2 in. to be left in the centre, of the thickness of the external walls, and headers inserted 3 ft. apart and 11 in. long, to ensure good bond. The bond used in the brickwork to be English. All arches to be axed and neatly pointed. Erect chimney shafts as shown, to engine-house, steaming-house, blacksmith's shop, and scullery. The flues to be well pargetted, and cleaned out at the completion of the works. The boilers to be set in 9 in. work, with furnace-bars, doors &c., complete. The framed partitions to be filled in with brick-nogging flat.

PAVIOR.

Pave the bullock-sheds and cow-house with bricks laid flat in cement, on a concrete base. Insert channel drains three-fourths of the distance up the centre of the stalls, and an open channel drain of stone or slate, 12 in. wide, 2 in. thick, and 3 in. deep, perforated at the bottom with a 9 in. earthenware drain under, to lead to small tanks sunk in the sheds. The tanks to be about 15 in. square, and 2 ft. 6 in. deep. Drains 4 in. diameter, to lead from these tanks to the manure tanks in yards, having cast iron gratings over them, just outside the sheds.

The stables are to be paved with Dutch clinkers, laid herring-bone fashion (or small squared Aberdeen granite). The dairy to be paved with foot tiles (or flag stone) with gratings let in, and drains to be laid to carry off waste water.

MASON.

Prepare and fix quarry-worked York stone sills to all window openings, 9×3 at least 4 in. on each side laid into the walls, and weathered and throated. York stone bases 12 in. deep, and at least 2 in. larger than the posts they have to support, to be chamfered and mortised. Guard stones of Aberdeen granite to be placed against all piers, angles of buildings having cartways in front, and to gate-posts. Provide and fix York stone sinks, 3 feet 6 in. \times 2 feet 3 in. \times 7 in. deep, to slaughter-house, dairy, and scullery, with bell traps let in, and supported on brickwork.

iii

3 in. York coping to be fixed on dwarf fence wall to entrance front, 2 in. wider than the wall on each side, weathered, throated, and mortised to receive iron railing; the whole to be properly cramped and run with lead. $2\frac{1}{2}$ York sills to all doors, 9 in. longer than the openings, 4 in. thick, and 6 in. wider than the walls. $2\frac{1}{2}$ in. York paving, with sawn edges, to be laid in the slaughter-house, steaming-house, scullery, and engine-house.

CARPENTER.

Generally. The timber not specified to be of oak is to be of the best Memel, Riga, or Dantzic fir, free from large knots, sap, and shakes. The oak to be English, die square. Lintels to all door and window openings 4 in. thick, the width of the walls, and 18 in. longer than the openings. Story and other posts where requisite, to be tenoned and let into mortises in stone bases, or sills. Oak bricks to be inserted for skirting, not more than 3 ft. apart, having one in each angle, and to all door and window openings.

The deals to be of the best well dried Christiana, free from sap, shakes, and knots.

BARN.

Oak story posts to external doors, 9×7 . Oak sills, 9×7 . Wheel spurs, to be grooved 2 in. deep, to receive lift board (if lift board be used). Framed partitioning, $4\frac{1}{2} \times 2\frac{1}{2}$, with diagonal braces, with heads and sills, 41 by 3 (to form feeding place for machine and space for machinery). Joists, $6 \times 2\frac{1}{4}$, covered with inch yellow boards. Oak sills on each side of thrashing floor, $4\frac{1}{2} \times 3\frac{1}{2}$, with dwarf framing 4 ft. 6 in. high, the uprights $4\frac{1}{2} \times$ by $2\frac{1}{2}$, braces $4\frac{1}{2} \times 2\frac{1}{2}$, top rail chamfered on the edges $4\frac{1}{2} \times 3$; framed into story posts, and lined with inch yellow deal, ploughed and tongued, the boards being rough. 21 in. framed, braced, and battened folding-doors, divided horizontally and vertically; the battens to be grooved, tongued and beaded on the joint, with locking-bar, staple, and hasp fastenings, hung with Collings' patent hinges. The breastsummer or lintels over these doors to be 8 in. deep, cambered and strengthened with circular knees 9×7 , well bolted with inch bolts. Wall plates, 7×4 , securely fixed, and dovetailed at angles. Rafters, $4\frac{1}{2} \times 2\frac{1}{2}$, notched on to wall plates. The beams 9 \times 3, secured to wall plates with strong iron dogs. Inch circular wrought-iron ring posts, purlins 5 \times 3, strutts 4 \times 3, ridge $9 \times 1_{\frac{1}{2}}$, diagonal braces $4_{\frac{1}{2}} \times 3$, inch yellow deal battens to carry slates (3 in. wide). Oak sleepers to thrashing floor $4\frac{1}{2} \times 3$, covered with $2\frac{1}{2}$ -in. oak planks, dovetailed with $\frac{1}{2}$ -in. rod to each joint on line, and well spiked. The space between the sleepers is to be filled with broken glass or flint stones and concrete, so as to form a solid mass, and laid to within a quarter of an inch of the under side of the planks, to prevent vermin from being harboured.*

* Or the floor may be formed solid with the patent block paving.

iv .

PROVISION SHED, WITH GRANARY OVER.

Door frames, 5×3 . 2-in. framed, braced, and battened doors, covered with inch yellow battens, grooved, ploughed, and tongued on joint, hung with 4-in. butts, and fastened with 10-in. stock lock. Story posts to carry floor of Granary, 9×9 , chamfered and tenoned, and let into stone bases and girders. Girders, 10×7 . Joists, 9×3 . Trimmers, 9×4 . Two bays of herring-bone strutts. $1\frac{1}{4}$ -in. yellow deal floor, rough edges shot. Framed and braced partitions, to form binns, $4\frac{1}{2} \times 2\frac{1}{2}$, the uprights chamfered and let into tie beams 6×3 . Sills and heads, $4\frac{1}{2} \times 3$. The timbers for the roof to be of the same scantling as for barn. Window frames, 7×3 , filled with luffer-boards, the luffer-boards to be of inch yellow deal, 6 in. wide, wrought on both sides and splayed, hung with iron pivots attached to an iron strap, and worked like Venetian blinds. A similar description of luffer-boarding to be inserted in the walls of all the other buildings. Prepare and fix a 2-in. stepladder, the steps housed to the framing with six iron screw braces, with nuts and strong hook-and-eye fastenings, with lines and pulleys to suspend the ladder, that vermin may not get up the ladder into the Granary.

CART SHED.

Story posts to gates 9×7 . $2\frac{1}{2}$ -in. framed gates, as described for barn, and the timbers for roof to be of the same scantling as those described for barn. Story posts in shed, 9×7 .

The Engine-house, Cattle-sheds, and all other enclosed buildings to have proper door frames 5×3 , and story posts where required 9×4 , the doors and gates to be 2-in. framed, braced, &c., as before described, with proper fastenings. The yard gates to be $2\frac{1}{2}$ in. thick, hung with patent hinges, to work on pivots, and made to traverse an iron plate, as described in Essay at page 31. The roofs of the foregoing buildings to be of the following scantlings, and put on in the manner described for Barn, viz.: Wall plates, 6×4 ; ties, 9×3 ; strutts, 4×3 ; purlins, 5×3 ; rafters, $4\frac{1}{2} \times 2\frac{1}{2}$; ridge and hips, $9 \times 1\frac{1}{2}$; battens as before.

The roofs of circular sheds to be of similar scantlings as described for barn, and supported by posts 9×7 , let into stone bases, with iron rods, 1 in. diameter, extending across sheds and passing through bases under the surface of the ground.

The scantlings of the roofs over sheep sheds, and other sheds, to be as described for engine-house, &c., supported by fir posts 7×6 , let into stone bases as before described. Ceiling joists where requisite, $4 \times 2\frac{1}{4}$.

The bullock-sheds and cow-house to have fir framed divisions, $4\frac{1}{2} \times 3$, to form stalls, let into heel-posts. Heel-posts 7 × 4, chamfered, let into stone bases, and into grooves or

slots in the beams, that they may be easily removed or taken away. Iron staples, 1 in. diameter, 15 in. long, to have nuts and bolts, to be passed through posts with strong iron rings and chains attached, to secure the cattle in their stalls;—the chains to have swivels in them, to prevent twisting.

The calf-pens to have 2 in. yellow-deal perforated ficors laid on oak sleepers, $4\frac{1}{2} \times 2\frac{1}{2}$. The floor to be framed in compartments, and hung with strong cross garnets, that they may be raised up to remove the manure under the floor. The divisions, forming pens, to be framed with fir, $4\frac{1}{2} \times 2\frac{1}{2}$, the end posts running up to the tie-beams and let into slots as before described. The framing to be 3 ft. 6 in. high, lined with inch yellow deal boards, each pen to have a door 2 ft. 4 in. wide, hung with cross garnets, and fastened with hasps, staples, and ten-inch bolts.

The slaughter-house to have 2 fir girders, 11×7 , running longitudinally with the building; well braced with diagonal braces; supported in the centre by two story posts, 9×7 ; chamfered and let into stone bases, with cross braces, 9×5 . A 2-inch deal-framed table, 4 ft. 6 in. long \times by 2 ft. 6 in. wide, with cut standards, 4×4 cross braces, and No. 2 drawers, with iron drop handles and proper locks. A 2-inch step-ladder, as described for granary, hung with 4-in. butt hinges to framing at back, and secured at base of ladder with strong cord.

The Dairy openings to have deal-cased frames, oak sunk sills, 1¹/₂-in ovolo sashes, single hung with flax lines, weights and fastenings complete. Wire gauze, or perforated zinc, to be fixed outside the building.

To Carpenters' Shop provide and fix a 2-in. fir framed work-bench, with braces and standards, 4×4 , 12 ft. long and 2 ft. 4 in. wide; cross braces 3×2 . A similar bench to be fixed in the Blacksmiths' Shop. Cut a hole in door of poultry-house, and prepare and fix a slide to same. The nests to be formed with fir framing, $4\frac{1}{2} \times 2\frac{1}{2}$, with inch deal bases; stages in front of nests 9 in. wide, and a door at back of each nest; the doors to be hung with $2\frac{1}{2}$ -in. butts, and to have button fastenings. Roosting-poles, $1\frac{1}{2}$ in. thick, oval in form, and rough, that the fowls may grasp them easily with their claws.

The Stable divisions, forming stalls, to be constructed in a similar manner to those for Bullock-sheds, but to be 7 ft. high at the mangers and 4 ft. at the heel-posts; the top rail to be rounded and ramped as shewn. The Nag-stable to be lined with inch yellow deal battens, ploughed and tongued. The mangers to be supported by oak posts, 5×3 , with two iron rollers let into each post, and worked by pivots. Racks, saddle-pins, hooks, &c., to be fixed where required. Fir-framed divisions, to form harness-rooms.

The fences to piggery, fodder yards, sheep yards, and weaning-house, to be formed with inch pales, 3 in. wide, as shown, with oak posts, 6×4 , charred at butts. No. 3 arris rails out of fir, $4\frac{1}{2} \times 3\frac{1}{2}$ ft., with gates hung with cross garnets, and hasp and staple fastenings.

vi

PLASTERER.

Plaster and set the walls of dairy, granary, and harness-room. Lath, plaster, and set the ceilings; also the rafters of poultry-house. Lime whiten the walls of stables and poultry-house.

SLATER.

Cover the roofs with best Bangor slates (countesses); those to bullock-sheds, cow-house, slaughter-house, steaming-house, and granary, to be laid hollow. The ridges to be of patent ridging slate, well secured. The slates to be well lapped, and fastened with galvanized iron nails: form $1\frac{1}{2}$ in. slate tanks secured with iron bolts, brass 3 in. cocks let in, and the whole made perfectly water-tight. Fit up the dairy with three tiers of $\frac{3}{4}$ in. slate shelves, supported by slate brackets. Provide and fix a slate top to table in centre of milk-room.

PLUMBER.

Provide and fix No. 3—3 in. pumps with neat cast-iron cases, one in dairy, one in slaughter-house, and one in scullery, with $1\frac{1}{2}$ in. lead suction-pipe, handles, buckets, &c., complete. Fix $1\frac{1}{2}$ in. waste-pipes to pumps, with iron bell-traps: the pipes to lead into drains. Provide and fix lead flashings to chimney shafts, 5lb. to the foot super.

SMITH AND IRONMONGER.

Provide a cast-iron boiler in steaming-house. The boiler to be 4 ft. diam., fitted with flange and cast-iron dome, the flange to dome to match the flange of boiler, and to be sufficiently true to allow of the joint being steam-tight, on a collar of felt being inserted between. The flanges to be screwed down with five screw clamps. Two handles to be screwed into dome with ³/₄ vent-pipe and cock, and waste-pipe and stop-cock. A cast-iron false perforated bottom also to be fitted to boiler ; fix 60 air-bricks where directed.—See Plate 2.*

GLAZIER AND PAINTER.

Glaze the sashes of dairy with Newcastle thirds glass, and paint all the external woodwork of the several buildings, together with fences, in 4 oils (or the whole may be twice tarred.)

* Potatoes may be cooked in this apparatus without water, the natural moisture of the roots being sufficient to well steam themselves, provided the vent-cock is shut off, to prevent any escape of the steam.

vii

SPECIFICATION FOR PAIR OF LABOURERS' COTTAGES.

PLATE 15.

EXCAVATOR.

Dig out the earth for the foundations to the several walls, drains, and cesspools, as shown in the drawings, or herein described. The cesspools to privies to be sunk outside the building. Fill up the trenches to the depth and width shown in drawings with concrete, composed of one part of ground-stone lime to six of gravel, broken stone, or clean ballast. Fill in and well ram the ground-work to the trenches and walls, so as to prevent the rain soaking down to, or standing against the walls and foundations.

BRICKLAYER.

The footings to the walls to be formed with sound, hard, well burnt stock bricks or burs from the brick-field, filled in solid, and well flushed with mortar. On the footings spread a layer of gas-tar and sand, and over this a course of slate is to be laid, should there be the slightest chance of dampness arising from the foundations.

The cesspools to be built in 41-in. brickwork, steened and domed over, having stone manholes let in.

The drains from the sinks to be 3 in. diam., of glazed earthenware, with syphon traps. The cesspools and drains to be completed previous to the walls being erected.

Carry up the walls and chimneys in old English bond, leaving a space of about 2 in. in the centre of the thickness of the walls, and insert air bricks where required. Carry up from the ceiling of each room, on corbel stones, a ventilating flue 6×9 in. All the flues to be well pargetted, and cored out at the completion of the works. The chimney flues not to be gathered over sharply, and twisted as much as possible.

The external walls are to be faced with best red stock bricks, white Suffolk bricks being used for plinths, quoins, and dressings to windows and chimney shafts; all of which are to be carried up in the manner shown in drawings. No wall to be at any time during the progress of the works more than 4 ft. higher than any other wall. No indents or toothings will be allowed, and no four course of bricks to exceed $11\frac{1}{2}$ in. in height.

All the brickwork must be worked in sound and regular bond, with a close joint neatly struck; every course well flushed in with mortar, and the whole made perfectly level, straight, and perpendicular. The chimney openings to have chimney bars to turn up at each end.

The quarter partitions to be brick-nogged with bricks, laid flat and well bonded.

viii

All openings are to have arches turned over them, with proper skew backs, and left neatly pointed.

The chimney jaumbs are to be chamfered, to have plinths, and two projecting bricks, cut as shewn in Plate 16, to support mantel-shelf.

The fire-places are to be lined with fire bricks, and an oven built at back. The bottom, sides, and top of oven to be of fire tiles, with flues for carrying the fire under and up the sides of the oven, as shewn in Plate 16. The smoke flues to be provided with dampers, and a door provided with damper leading to the oven, which is to be fixed in chimney jaumb. Fire-grates are to be formed by letting round iron bars into the brickwork of fire-places.

The privies to be provided with Doulton and Watts' closet pans, and glazed earthenware pipes leading to cesspools. The boilers to be set with rounded bricks, and the inside work, where exposed to the fire, lined with fire brick.

The mortar to be composed of one part of good lime to three of sharp sand, or fine-sifted gravel; the whole to be well tempered.

Properly bed all lintels, plates, frames, and sills; point round all frames and sills; stop all putlock holes; and leave the works in a complete state.

MASON AND PAVIOR.

Provide and fix 4 in. tooled York stone steps to porches and entrance doors. Provide and fix 3 in. York stones over cesspools: 4 in. stones for corbels, to carry brickwork to air-flues; a circular space about 4 in. diameter to be cut in these stones, and a ventilating valve inserted in each. Inch hare-hill hearths, and back-hearths to all chimney openings, with stone-kirbs round to act as fenders. The kitchens to have ash-pits with iron moveable gratings over. Sink-stones to wash-houses 2 ft. 6 in. by 1 ft. 9 in. out of 7 in. stone, properly dished (or wood lined with zinc may be used), each sink to be provided with a bell-trap. Pave the porches and pantries with 10 in. tiles, well bedded, the ground being previously well rammed. The rest of the ground-floors to be made with concrete, ashes, &c., as described in Essay, at page 9. 2 in. York-stone treads, and risers to stairs, properly cramped, and supported by dwarf brick walls. The floors of privies to be paved with $1\frac{1}{2}$ in. York stone.

CARPENTER.

The fir timber to be free from sap, large knotts, and shakes. The oak to be English, diesquare. The framing to be executed in the most approved manner, and to be of the following scantlings:—Wall-plates, $4\frac{1}{2} \times 2\frac{1}{2}$; lintels over all openings, 4×4 ; chamber-joists, $7 \times 1\frac{1}{2}$, 12 in. apart, with bays of herring-bone strutts 2 ft. apart, thin iron hooping being nailed to the under side of the joists, and the space between the joists to be filled up solid with broken stone,

ix

or clay and mortar. Trimming joists, 7×3 ; strutts, 4×2 . Partitions to have heads and sills, 4×3 : uprights and braces, 4×2 . Door-frames chamfered on the edges, 4×3 . Rafters, $4\frac{1}{2} \times 2\frac{1}{2}$. Purlins, 4×3 . Collars to every sixth pair of rafters, 6×2 : ridge, $7 \times 1\frac{1}{2}$.

³/₄ yellow deal battens to carry slates. Provide and fix 2 in. cut and splayed barge-boards, with pinnacles, &c., as shewn.

JOINER.

External doors to be square-framed and battened, hung with 4 in. butts, with 7 in. drawback locks, 6 in. round bolts (2 to each door), and Norfolk thumb-latches. $\frac{3}{4}$ ledged internal doors, and $\frac{3}{4}$ ledged privy, pantry, and coal-closet doors, with bolts and latches. The doors to have inch jaumb-linings and stops.

WINDOWS.

Solid deal frames, $4\frac{1}{2} \times 3$, with oak-sunk sills; $1\frac{1}{2}$ ovolo sashes, suspended by pivots; those in the pantries to be filled with perforated zinc.

FITTINGS.

Inch deal seats and risers to privies, on fir carriages. The seats to have flaps hung with $2\frac{1}{2}$ in. butt hinges. One shelf to be fixed round each cupboard closet in bed-rooms, and three in those in kitchens. $1\frac{1}{2}$ in. dresser-tops, and three shelves to pantries. Angle staves to be provided and fixed to all angles. $\frac{3}{4}$ clamped shutters to dwelling-rooms, hung as flaps, with deal framed brackets, to be turned on pivots, the flaps forming tables. Fir mantel-shelves, 6×2 , over each opening.

PLASTERER.

The walls of the dwelling-rooms and bed-rooms to be rendered and set. The ceilings and rafters lathed with iron hooping; the space between the joists and rafters filled up solid with broken stone, or earth and lime. The ceilings to be plastered, set, and whited. The chamber floors to be laid with floor plaster, and trowelled to a smooth surface. The walls of the sculleries, pantries, coal-closets, and water-closets, to be twice lime-whited; cement skirting, 6 in. high, to be run round all the kitchens and bed-rooms.

SLATER.

Cover the roofs with countess slates, laid hollow to a proper gauge. The ridges to be of slate, bedded in cement.

х

χ.

IRONMONGER.

Fix No. 8 14 round iron bars to all the fire-places to form stove. Fix galvanized iron pans in sculleries. Fix where directed an iron pump, with double handle. Fix 4 in. semi-circular zinc eaves-gutters to roofs, with stopped ends and proper bearers. Fix No. 4 stacks of 4 in. descending pipes, with cistern heads and shoes, the bottom length to be of cast iron. Provide and fix No. 12 cast iron air bricks, to be fixed where directed. Fix No. 8 Arnott's valves where directed. Fix perforated zinc plates to doors of rooms not having chimney openings in them. Provide No. 10 chimney bars, to turn up at each end.

PLUMBER.

Inch lead waste pipes from sinks to drains, curved round so as to form stink-traps, and provided with bell traps. Lead flashings to chimneys, 5 lb. to the foot. super. Provide and fix 15 ft. of $1\frac{1}{2}$ suction pipe from well to pump.

GLAZIER AND PAINTER.

Glaze the several sashes with 3rd Newcastle crown glass. Stain the whole of the woodwork of the exterior with a composition of gas tar and Roman ochre, laid on when boiling hot. The interior to be stained with "Stephens' stain," and afterwards varnished.

It should be borne in mind that different sites require varied arrangements. In the foregoing specifications the walls are supposed to be built with brick. The thickness of the walls, as in Plate 1, is the proper thickness for brickwork, but the thickness of those in Plate 9 is that suitable for rubble-stone walling.

It has been shown in the preceding Essays, that a variety of materials may be advantageously used in Farm Buildings and Labourers' Cottages; consequently, the facilities of obtaining the several descriptions will increase or diminish the cost of erection. Where stone, timber, bricks, slates, or tiles are found, or manufactured on or in the immediate vicinity of estates, buildings may be erected for much less sums than hereafter stated. Where these facilities do not exist, the author will undertake to get the plans carried out for any of those noblemen or gentlemen who have been pleased

xi

to patronize his productions, for the sums stated (should there be no unusual difficulty in the way), by respectable and responsible contractors. As some guide to the actual cost of the cottages, the author begs to direct attention to thirty pairs, designed and superintended by himself two years since, which are similar in character to those shown in Plate 15, but not quite so ornamental. These cottages were erected at various times, by several contractors, for the sum of £180 per pair. They are situate at Plaistow, Essex, and have been denominated "Model Cottages."

The ground plan of Plate 9 is calculated for 1,200 acres of land, of a mixed character; the bird's-eye view of which, as shown in Plate 10, will probably be considered too costly for the generality of agricultural buildings. It was designed pursuant to instructions with which the author has been honoured. The cost is, however, estimated upon the supposition of the buildings being erected in a plain but substantial manner. With respect to the house and lodge, so much depends upon the style of fitting them up, that a sum has been stated as the probable cost. The same course has been adopted with respect to the ornamental fencing to the south front of steading.

xii

ESTIMATE OF FARM BUILDINGS, AS SHEWN IN PLATES 1, 2, 3, 4.

| | r | \$. | a. |
|---|-----|-----|----|
| Dairy, Carpenters' and Blacksmiths' Shops, Fattening-coop and | | | |
| Saw-pit | 190 | 18 | 0 |
| Poultry-house, Nag Stable, Harness-room, and Gig-house | 222 | 15 | 0 |
| Cart-horse Stable, Horse-box, Harness and Chaff-house, and Hay- | | | |
| house | 418 | 10 | 0 |
| Cart-shed, Implement-shed, and Tool-house | 145 | 16 | 0 |
| Barn | 385 | 0 | 0 |
| Straw-shed | 50 | 10 | 0 |
| Engine-house, Shaft, and setting to Boiler | 125 | 0 | 0 |
| Provision-shed, Granary, and Turnip-shed | 298 | 10 | 0 |
| Bullock-shed and Store-shed | 263 | 0 | 0 |
| Cow-house and Calf-penns | 220 | 10 | 0 |
| Hay-house and Shed for sick Stock | 68 | 0 | 0 |
| Slaughter-house, Scullery, Wood and Coal-shed | | | 0 |
| Piggery and Steaming-house | | | 0 |
| Weaning-house and Sheep-folds, including fencing | | | 0 |
| Circular Shelter-shed for Cattle, with fencing | 85 | 0 | 0 |
| Ditto. ditto. ditto | 85 | 0 | 0 |
| Two pairs of Entrance Folding-gates, with posts, &c | 25 | 0 | 0 |
| Enclosing wall to south front, with stone caps and iron gates | | | 0 |
| No. 6 Slate Water-tanks on brick piers | 40 | 0 | 0 |
| No. 8 Manure-tanks | 50 | 0 | 0 |
| | | | |

Total cost.....£3,187 19 0

Drain-pipes

| | £ | \$. | d. | |
|----------------------|-----|-----|----|--|
| ESTIMATE for Plate 7 | 149 | 0 | 0 | |
| " Plate 8 | 250 | 0 | 0 | |

xiii

ESTIMATE FOR PLATES 9 & 10.

| | ~ | | |
|---|--------|----|----|
| Buildings on East and West sides of Steading | 1,303 | 0 | 0 |
| Ditto on North side ditto | 890 | 0 | 0 |
| Dairy, Poultry-house, Sheep-folds, Piggeries, and Stock-yard, | | | |
| buildings and fencing | 1,022 | 10 | 0 |
| House | | 0 | 0 |
| Lodge | 150 | 0 | 0 |
| Ornamental cast-iron Fencing, with dwarf brick wall and stone | | | |
| work , | 250 | 0 | 0 |
| | | | |
| Total cost | £4,615 | 10 | 0 |
| And the second | | _ | |
| | £ | 5. | d. |
| ESTIMATE for Grass-farm Steading, Plate 11 | 1,024 | 0 | 0 |
| " House | 360 | 0 | 0 |
| | | | |
| Total cost | £1,384 | 0 | 0 |
| | | | |

ESTIMATE OF COTTAGES, PLATES 13, 14, 15.

| | | | £ | s. | a. |
|---------|----------|-----------|---------|----|----|
| Pair of | Cottages | Plate 13. | 320 | 0 | 0 |
| Ditto | ditto | Plate 14. | 148 | 0 | 0 |
| Ditto | ditto | Plate 15. | 220 | 0 | 0 |
| | | | | | |

NOTE.-Subscribers can be supplied with full detail quantities of the Cottages for *L*1 per pair, and of any or all of the Farm Buildings at a similar rate of charge, on application to the Author.

FINIS.

xiv



























Incline 1 Foot in 300



Ground Plan of Rick Frame











SCALE OF FEET

He had here

po Lith. Waterley & Sme, Looker.

G.A. DEAN. Inch!


















LABOURER'S COTTAGES. Bair of Semi Detached



ELEVATION



SECTION A TO B

wand have



CROUND PLAN



ONE PAIR PLAN

G. A. DEAN. Arche

1

SCALE OF FEET.

PLATE 14.





COTTAGE AT SNIG'S-END .- BACK.



G.A. DEAN, Arch!



Plans of Kitchen Range; Oven &c.



ELEVATION



TARK FET

PLATE 16

G.A. DEAN, Archt









