SPECIFICATIONS IN DETAIL

FRANK W. MACEY

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BY

FRANK W. MACEY

ARCHITECT

AUTHOR OF "CONDITIONS OF CONTRACT"

SECOND EDITION

REVISED AND ENLARGED

LONDON

CROSBY LOCKWOOD AND SON

7 STATIONERS' HALL COURT, LUDGATE HILL

1904

PREFACE

TO THE

SECOND EDITION.

THE present Edition has been revised and enlarged; but that part of Specification writing referred to in the first edition as being of too great a range to be embodied in it, has since been treated of by the Author in another work—"CONDITIONS OF CONTRACT."

Thus "SPECIFICATIONS IN DETAIL" deals with the Constructional and Practical sides of the subject, and "CONDITIONS OF CONTRACT" with Contracts and Agreements as applied to all classes of Building Work, and with the Law generally in its relation to various matters coming within the scope of the Architectural profession.

FRANK W. MACEY,
ARCHITECT.

1, LOMBARD COURT,
GRACECHURCH STREET, LONDON.
July 1904.

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SPECIFICATIONS IN DETAIL.

GENERAL NOTES.

By carefully perusing these explanatory notes, much assistance will be obtained in writing an efficient Specification, in digesting the contents of this work, and in following the system upon which it has been compiled.

A Specification for Building Work may be said to be divided into three parts:—

> "The Conditions of Contract,"—these are the terms upon which a contract is given.
>
> "The Description or Specification in Detail" of the actual Work to be done and the Materials to be used.
>
> "The Agreement" or that part which formally binds the parties to fulfil their respective obligations.

But, strictly speaking, the Specification only refers to the actual building work.

The various Conditions of Contract, Forms of Agreement, Tender, Schedule of Prices, and all such like matters, and points of Law in relation to Building Works, and to the Parties subscribing to a Building Contract are dealt with fully in another work—Macey's "Conditions of Contract."

The present Work deals only with the constructional and practical sides of the subject, that is the Specification in Detail of the actual work to be done and the materials to be used. And it is, as far as possible, intended to be used as a basis for a "Model Specification," divided into "Model Clauses," which may be applied generally to the various details of recognised work, without referring to any one class of building in particular; but ecclesiastical work in its special requirements is not intended to come within the scope of this work.

Many of the "Clauses" are self-explanatory, but where the description seems somewhat involved, an explanation is given as a footnote under the clause in question. The Clauses are set in from the margin, the notes preceding and following them being written across the page.

The sketches are not drawn to scale, the object being merely to assist the descriptions.

The "Clauses" describe the usual methods of executing work, the sizes given being those mostly employed in practice for good work. The items in brackets as well as many of the footnotes, show various alternative ways of executing work. With regard to the scantlings of roof timbers, floor joists, girders and similar structural parts, which vary in their dimensions to an almost unlimited extent according to the loads to be supported, and the distances to be spanned, one example only is given of each, which with the requisite modifications may be applied to any work under consideration.

To save repetition, many cross references are given, which call attention to other clauses under various Trades; and for the sake of brevity, when several Trades are included under one heading, only the first of those Trades is mentioned in the reference; thus, when a reference is given to a clause under the heading of "Carpenter, Joiner and Ironmonger," the trade "Carpenter" only is mentioned.

As an additional facility for easy reference to the Clauses, numbers in brackets are placed at the head of the various pages, showing at a glance the numbers of the Clauses embraced by those pages.

POINTS IN SPECIFICATION WRITING.

A Specification may be either longer or shorter according to the particulars given upon the drawings. Some Engineers favour a short Specification and prefer to put as much written information as possible upon the drawings. One reason for this is that Engineers usually supply a number of details with their Contract Drawings which enables them to put many notes upon those drawings. On the other hand Architects do not usually supply many details with their Contract Drawings, consequently somewhat lengthy specifications are necessary. Either method may be adopted if the requisite information be clearly given.

A Specification should not supersede the particulars given upon the drawings, but should more fully explain those parts which the drawings do not clearly illustrate, or which are in any way obscure. It is impossible to show every detail upon the drawings, consequently a full description of those parts becomes absolutely essential in the Specification.

Drawings give the general arrangement of the building, and the Specification should describe the details of that arrangement. These drawings should have figured upon them all important dimensions, such as the lengths, widths, and heights of the various distinct parts of the building; the thickness of walls; the depth and width of the concrete foundations; the sizes of floor joists, roof and flat timbers; the widths and heights of doors and windows; and all other similar and important parts and items. It is seldom that drawings to a small scale are so accurately drawn as to be quite clear with regard to the sizes of certain parts unless these parts are given in figures. The only other particulars to be put in writing on the drawings would be the names of the rooms and other parts of the building, together with any notes or references which might assist the description in the Specification. With regard to small scale drawings—these must not be laboured by showing every brick and slate. Working drawings will be far clearer without too many lines.

But in the Specification, everything must be included except the general dimensions of the various parts of the buildings. The sizes of the joists and roof timbers must always be described, as well as sometimes being given on the drawings, and there is no harm in specifying the thickness of the various walls, the depth and width of the concrete under the walls, or any other detail of the building. A Specification which is full, but at the same time concise and to the point, will prevent mistakes and misunderstandings when the building is in progress, and of course the Specification should always agree with the Drawings.

Presuming then that the Drawings have been prepared and it is necessary to write a rather full Specification:—What is the first consideration? A complete knowledge of the subject matter must be had, that is, of the details of building construction and of the value and properties of materials. In other words, it must be known what has to be described. And until this point is mastered it will never be possible to commit to writing the proper descriptions needful to the erection of a building. Therefore a complete knowledge of all the requirements and details of the various Trades coming within the scope of the architectural profession, is the first consideration in efficient Specification writing. And in addition to this, a knowledge must be had of the various Acts and bye-laws relating to Buildings.

But it is impossible to know everything at once, and when in doubt upon some point, the only way is to insert a Provisional Amount to cover the item, and to obtain the requisite information afterwards. There are only two ways to gain this information, study and observation. First to read any works obtainable which bear upon a doubtful point (and much useful information may sometimes be obtained even from Trade catalogues), and then to discuss the matter on every possible occasion with any one who has any knowledge of the subject, and further to notice what is going on around; many practical hints may be obtained merely by observation whilst passing down a street where building operations are in progress.

A draft Specification must not be hurriedly written, with the intention of altering and supplementing it when revising for fair copying, but it should be written with great care and thought. Being fresh to the matter, even so dry a subject as Specification writing creates a certain amount of interest, and while the mind is concentrated upon the matter there will be less likelihood of omitting many small items. Therefore the first draft must be as complete as possible. And while engaged upon the Drawings much assistance will be gained if notes are made of any obscure item coming under observation at the time.

When a Bill of Quantities is prepared, it is usual for the Quantity Surveyor to make notes of any item omitted from the Architect's Specification. If this be not done then the Architect must run through the Bill of Quantities and adjust the Specification to it before the Contract is signed. And here it will be well to note that when sending out a number of fair copies of a Specification, see that they all agree.

A full Specification will save many an anxious moment; constant disputes occur with the Builder and many extras crop up owing to omissions and imperfect wording, which ordinary care would prevent. A Specification is a legal document to be followed only so far as it goes.

In many Specifications the descriptions frequently given are incomplete; thus wording to this effect may often be seen:—

> "That the Builder is required to perform a certain work all complete," or "all as required," or "as necessary."

Generalising in this way merely shows that the Architect does not know what is required, and the consequence is, that either an unfair estimate is obtained, or an incomplete work is performed or else a dispute ensues with the Builder as to what was intended or required. When a difficulty arises of not knowing the proper description of an item, the only plan is to put in a Provisional Amount, and to let the item work itself out in execution. But as far as possible let the descriptions be definite, clear and comprehensive.

There are two words which are often employed promiscuously in a Specification, and these are "provide" and "supply." It is immaterial which is used. It is better however to keep to one word or the other throughout, and then there will be no ambiguity.

But there is another word used in a Specification the meaning of which is often disputed. It is the word "best" as applied to workmanship and materials, and more especially to the latter. Such terms as "best finish," "extra best," "super best," "best best" and so on should not be employed at all, but merely the one word "best" coupled with a definition of the word.

Here is a suggested definition of this word:—

> The word "best" as applied to materials, articles and workmanship shall mean, that in the opinion of the Architect, there is no superior quality of material or finish of article on the market, and that there is no better class of workmanship obtainable.

In fact by describing this word "best" it need only be mentioned in the one clause stating that all materials, articles and workmanship are to be of the best quality, class and description.

There are several ways to curtail the descriptions in a Specification without detracting from the merits of the document. Many items which apply under similar conditions to several parts of the building may be generalised; thus, take for example the skirtings to a building. A general clause applicable to all skirtings may be inserted somewhat to this effect:—

> All skirtings to be rebated to floors, tongued and mitred at angles, tongued at heading joints, housed into architraves, returned and mitred at ends, and fixed to double splayed narrow framed grounds with dovetailed backings and filling out blocks, and plugged to walls.

The only further description then necessary will be to refer to each particular skirting, such as:—

> Attic skirtings 7 in. $\times$ 1 in. plain deal.
>
> First Floor skirtings 9 in. $\times$ $1\frac{1}{4}$ in. moulded deal, and so on.

By this means repeated descriptions of the fixings and backings to each separate class of skirtings are avoided. In the same way the backings and fixings to door and window linings and many other items where the conditions are similar may be generalised.

Further, if any detail drawings are supplied with the Contract Drawings (which is not always the case), a Specification may be much shortened without detracting from its efficiency by merely referring to the detail drawings in question, and at the same time mentioning any particular feature not readily to be gathered from those drawings. Thus, take an ornamental carved screen across a hall with doors and glass, full details of which have been provided with the Contract Drawings. It will simply be necessary to refer to the screen in question, and to mention the class of wood of which it is to be formed, together with the ironmongery and glass, and perhaps to give a provisional amount for the carving; and thus avoid describing the sizes of all the parts, such as the thickness of any pilasters, or the sizes of any mouldings, architraves or cornices, provided these particulars are all to be gathered from the drawings. Thus in about three lines may be stated all that is necessary which otherwise would perhaps occupy a dozen or twenty lines.

There is another way to shorten a Specification. Take for example the windows to a building, one or two of which are dissimilar from the rest. First describe the special windows; and then refer to all the other windows throughout in one item, and do not describe them to each floor separately. Take again the external facings to brickwork; describe any special facing first, and then the whole of the other facings to all parts in one item without reference to position. There are many other items which may be similarly treated. One more suggestion—The wording itself of a Specification may be much curtailed by care and practice. It will not be possible to write concisely and to the point until many Specifications have been written. Therefore the wording must not be laboured needlessly nor the items repeated unnecessarily. In time the requisite language will come simply and quickly.

Another important point in a Specification is that it should be clear and readily understood. To avoid confusion the various parts of a complete item of work should be tabulated as much as possible by placing each separate particular under the preceding one. It will take more paper, but there is no objection to that, for it will make the description clear at a glance. The form of tabulation should be somewhat as in the following illustration describing a roof formed with trusses.

> The roof to be formed of (say) six whole trusses and two half trusses. The trusses to be placed 10 ft. apart and composed of the following scantlings, and the whole to be notched, framed spiked and strapped together.
>
> Tie beams 12 in. × 6 in. resting on 2 ft. 6 in. × 12 in. × 3 in. tooled York templates.
>
> King Posts out of 6 in. × 5 in.
> Principal Rafters 6 in. × 4 in.
> Struts $4\frac{1}{2}$ in. × 4 in., and so on.

Here each separate component part of the roof is placed immediately under the preceding one until all the items have been described. Thus at a moment the sizes and particulars of any one special part of the roof may be seen.

This form of tabulation will be found much clearer than the method so often adopted of running on the particulars of the various items line after line without a break. In the same way may be tabulated the descriptions of floors, windows, doors and many other distinct items, severally composed of many parts.

Another aid to the clearness of a Specification is to divide the descriptions into many clauses, and not to make them too long. Also the clauses should be kept well apart and not crowded together; any item will then be quickly seen and there will be no question as to the part of a building to which a description belongs.

As a general rule a Specification should be divided into separate Trade headings, but very many distinct items of work would be clearer and more comprehensible if the various Trades relating to them were not separated, but the complete item of work described under the one heading placed in whichever part of the Specification seemed most desirable, thus:—

Take an iron casement window with wood frame, linings, and the usual glass and fittings. Ordinarily this would come under several Trades. But it would be better to describe everything connected with that window under the one heading of say Joiner, that is—the iron casement, the wood frame, linings, shutters and finishings, the ironmongery and glass, with a cross reference under Smith stating that the iron casement was described in Joiner. The Builder will see at a glance all the requirements of that window and the Employer should also have an idea how it will look when finished.

Again, take an iron girder; this should be described under Smith and Founder, the girder itself, the templates, cover stone, any cement packing, felt or lead seating, and the painting. But perhaps it might be better to generalise the painting under Painter in the one description applicable to all girders and covered up ironwork, and in that case a reference to it should be made under Smith and Founder; there will then be no excuse for the painting to this work escaping the Builder's attention.

When describing the work to small alterations, repairs or decorations, it is almost essential to adopt this order of running on the descriptions regardless of Trade headings and formalities. Of course when work is let to separate tradesmen this method cannot be adopted.

It has been mentioned before that a Specification may be said to be divided into three parts:—The Conditions of Contract, the Agreement, and the Specification of the subject matter embraced in the Contract. The Conditions of Contract and the Agreement should only embody the actual legal requirements which taken by themselves do not affect the description and value of the work and materials. But in many Specifications under the heading "Conditions of Contract" are placed many clauses which affect the amount of the Estimate. This is a mistake, for at the time of tendering, a Builder as a rule scans the Conditions of Contract hurriedly, and when reading them over again preparatory to signing the Contract, may unfortunately find there are several items included which he has omitted to price in his Estimate. The Employer does not always admit the force of this contention, and the Builder either has to bear the loss or throw up the work.

But that part of the Specification, or in other words, the Specification of the actual work and material should embody every item which may in any way affect the Estimate; therefore under the General Clauses or Preliminary Items as they are often called, it will be well to include the following matters which are so often placed only under the Conditions of Contract.

> The date of completion. This requirement may necessitate an extra allowance for overtime or other special employment of labour.
>
> The mode of payment. Under certain conditions the Builder may require to borrow money to enable him to carry on the work between the times allotted for payment.
>
> Keeping the work in repair for a stated period after completion. This may necessitate an allowance to cover any matter which may crop up under this item.
>
> The Insurance fees and fees to any authority should also be included under this heading of Preliminary Items, as also any other matter not coming under a Trade heading which may possibly require a price.

It will not be necessary to set these clauses out at length under the Preliminary Items when they are already given under the Conditions of Contract, but merely to make a note stating that they will be found fully described under the Conditions of Contract.

A marginal note or reference should be given to each distinct item of work. It will then be seen at a glance where say "the casing to a bath" or the "spandril framing to a staircase" is placed, instead of having to wade through pages of other subject matter. In addition to the marginal notes all the principal items should be put under sub-headings in their respective Trades. Such as all wood staircases under a sub-heading of "Staircases" in Carpenter and Joiner; similarly all casement windows under a sub-heading of "Casement Windows"; and all other such divisions of work. And the many minor items which only require a separate clause to each might be put under the one sub-heading of "Other Items" or "Other Fittings." These sub-headings should be placed in the body of the pages.

It is very important to number the Clauses in a Specification. It will be of great assistance to be able to refer in a letter to the number of a Clause when calling the Builder's attention to any special part of the work; as well as in the case of cross references when referring from one part of a Specification to another.

The numbers may be run on either consecutively from the commencement to the end of the Specification, or else be started afresh under each separate Trade. The latter course is perhaps preferable, as a Clause can then be easily added to any one Trade without disturbing the numbers of the other Trades. But in a short and simple Specification, especially if the Specification is not divided into Trade headings at all, then it is better to run the numbers straight on. In either case, each separate paragraph need not be numbered, but only each distinct item of work which may perhaps embrace several paragraphs.

In many cases marginal sketches will be found useful to illustrate any involved part of a Specification. These must be drawn carefully so that the Lithographer may make an accurate copy of them, in case lithographic copies of the Specification are issued. If the Specification is typewritten or fair copied in the Office then the Architect must either do all the sketches himself or see that they are copied correctly.

Sometimes there is a difficulty as to where Provisional Amounts and Prime Cost items should be placed in a Specification. Is it better for each amount to come under the Trade in question to which it refers, or should they all in a body be put together? No hard and fast rule can be applied to this, but small Provisional Amounts may run on with the subject matter to which they refer; and distinct and perhaps more costly Provisional Amounts should be all placed together under the one heading "Provisional Amounts," either immediately following the Preliminary Items or else at the end of the Specification.

The general run of "Prime Cost Amounts" usually applies to small matters, and these amounts should follow the items to which they refer. But if distinct or of any considerable value then they should be put under the heading "Provisional Amounts."

A Specification is sometimes provided with an Index similar to that to be found with a technical or scientific work. It certainly makes the Specification complete and handy.

The Index need not be too long, but merely embrace the references to the principal items. It may be made out either alphabetically or else under Trade headings, perhaps the former method is preferable, set out somewhat in the following manner:—

INDEX.

A		J	
	PAGE		PAGE
Arches, first floor - -	—	Joists, first floor - -	—
„ ground floor -	—	„ second floor - -	—
D		S	
Doors, first floor - -	—	Staircases, stone - -	—
„ second floor - -	—	„ wood - -	—
F		W	
Flooring, first floor - -	—	Windows, first floor - -	—
„ ground floor -	—	„ second floor -	—

And so on may the items be tabulated.

Sometimes it is difficult in a Specification to locate the description of a particular part of the work when there is no distinctive mark or name on the drawings. To effect this purpose the points of the compass may be employed in so far as they will apply, but when a position is situated perhaps centrally, this method fails in its utility. In such a case it is well to put a number or a letter on the drawings (and that preferably in a circle) against the part in question, and so refer to it in the Specification. Many of these references will not be required as the drawings will generally be sufficiently clear to locate the descriptions by referring to the ordinary parts of the building by name or position.

An old Specification should not as a general rule be consulted when describing the work relating to another building, excepting in the case of one or two matters—such as the General Clauses coming under the Preliminary Items, the preambles to the various Trades, and the other general covering clauses under those Trades. But the details of the actual work should be written entirely in the first place without any reference whatever to a former Specification. All detail descriptions cannot be exactly alike, and any necessary variation of a detail in question will be far more likely to be correct if it is thought out as it occurs, than if it is copied from an old description and altered afterwards to suit, because when an item is copied its details cannot be so carefully considered.

To obviate omitting any of the general items common to all work, it is well to make a form or tabulated index of the items coming under the various Trades. This can be looked through at a glance and all the items extracted which may be required.

A Schedule of these items may be made out somewhat in the following manner:—

SCHEDULE OF ITEMS.

BRICKLAYER.	MASON.
Bricks.	Stone.
Lime.	Joints.
Cement.	Corbels.
Sand.	Core.
Lime mortar.	Templates.

And so on may the items under each Trade be set out. A fairly complete list of these items may be taken from the Clauses in this work. Additions may be made to the schedule as fresh matter presents itself.

Certain materials are often described in a mechanical manner, such as timber from a market which has long since been exhausted; or stone from a quarry which has been worked out; or by using misleading or exaggerated language, such as "the timber to be free from all knots," demanding what in many cases it is impossible to obtain. Only specify what can be obtained and what is required, and then see that it is supplied.

It is not always clear how to deal with sub-contracts, that is, with contracts for certain portions of the work executed by some person or firm other than the Builder. It will save many difficulties arising, if as a general rule, all sub-contracts are allowed to go through the main contractor's hands. But when this is impossible, then make the sub-contractor subject to most of the conditions of the main contract equally with the Builder, and in the main contract stipulate that the Builder is to give every facility to the sub-contractor and to allow him the use of his scaffolding and plant.

Having so far settled the general scope and bearing of a Specification, the next step is to put the various items into order. As before mentioned, there is no better plan than to divide the Specification into separate headings or Trades as they are called. As to the order in which these Trades should come, that is not so very essential, but each Trade if possible should be placed in that order in which the building would be erected. It is not always possible to carry this out, but whatever order is once adopted let it be done in all future Specifications, and it will then be known in what part any item may be looked for.

A Specification should commence with the Preliminary Items or General Clauses, and under this heading would come every item that would apply to the building as a whole. Then would follow the Trade of Excavator, this being the commencement of the actual work. Then the Trades embracing the structural parts of the building, such as Bricklayer or Mason, whichever Trade would apply chiefly to the walls. In like manner the building must be built up on paper until it is roofed in, when the Trades taking the interior fittings, finishings and requirements would follow, and finally the decoration and painting.

As to what items each particular Trade should embrace or into how many Trades the Specification should be divided, that would to some extent be decided as a matter of convenience and clearness consequent on the nature of the building in question.

Thus if Pavior is a considerable item, make it a separate Trade, but if the work coming under it is of minor account, then let it be included under the trade of Bricklayer. Again if the drainage is a large item let it be made a distinct Trade instead of putting it, as is often done, under Excavator. While mentioning the subject of drainage, it may not be out of place to state, that the drains should be laid before the building is erected, otherwise there may through carelessness in undermining the foundation be some settlements in the walls which may affect the stability of the building. And when the drains are laid, if not encased in concrete, they should be carefully covered up at once, so that the pipes may not be liable to be damaged from any falling material.

Further, floor and wall tiling might either come under Pavior, Bricklayer or Plasterer, as each of these trades in certain parts of the country is performed by the same class of workmen. Many other items may be treated in a similar manner.

Each Trade is started with a preamble, that is, with general clauses mostly applicable to all the items under that Trade—such as the description of the various materials; and the general covering clauses referring to similar parts of the work in different positions; after which the actual items of work follow on in detail. Strictly speaking a preamble is an introduction or preface, but in a Specification the term is applied in the sense of denoting the general clauses and descriptions at the beginning of each Trade.

Going more fully into the various items of almost similar description under each Trade, the best plan in most cases is to describe all the items of a similar nature to each floor separately from the lowest to the topmost story. But if the description will apply equally over the whole of the building, the item should be described without reference to each separate floor and thus save useless repetition. As to the exact order of the various items under each trade, they should be put as far as possible in the order in which they would be built. But there is no hard and fast rule to follow in this respect, as in many cases it will be clearer to run them on regardless of order.

When describing the various items of work the class of material must be clearly stated, thus, give the particular quarry and bed of stone, with the labour to be expended on it, such as if it be dragged, tooled, rubbed or otherwise worked; mention the class of wood for the timber and joinery work, and state whether it be rough, wrought, framed or circular. A general clause such as this, "that all exposed faces of timber and joinery work, except where otherwise mentioned, are to be wrought," will save repetition of this word "wrought." Further, state if Portland or other kind of cement is required, the word Portland being often omitted. And all other descriptions of materials should be clearly defined.

THE ORDER OF A SPECIFICATION.

It will be advisable now to take the order of the principal items under the various Trades.

In Preliminary Items, no particular order is essential, but it would be as well to keep the clauses in that order which would mostly run with the order of the work on the building. If old buildings are to be removed, the description would come under this heading of Preliminary Items. But if a Housebreaker is employed for this purpose, then this work would form a separate and distinct Contract by itself, and the general Specification would merely need a clause for the removal of any rubbish, and for the return of the shoring and hoarding to the Housebreaker.

In Excavator, take the surface excavation first, then the deep excavation such as that to Basements and Cellars, then the general excavation to the foundations and the attendant items such as planking and strutting, filling in and ramming, and finally any other small or particular items. Then describe the concrete foundations, after which the surface concrete and any brick rubbish under, then the concrete floors, roof and stairs. If the walls of a building are in concrete, take these immediately after the concrete foundations of which they then would form a part.

Under Drainage, describe the manholes first, then the pipes with the concrete, then the gullies and other similar items.

The items under the trade of Pavior are so simple that any order might serve, but take first the important items of internal paving and follow on with the smaller items, and finish with the external paving.

In Bricklayer, commence with the general walls of the building, then the damp course, hoop iron bond and other attendant items. Then those parts in cement, such as rough arches, trimmer arches, piers, sleeper and fender walls, half brick walls, and dry areas. Then the external facings and pointing, gauged or other external arches, dressings, mouldings and ornaments, external glazed brickwork or flint facings. Then the internal facings and pointing, enamelled brickwork and wall tiling. Boundary and retaining walls and such like distinct items should come last and be described separately and completely by themselves. Terra cotta for facings might come either with the other external facings, or be kept as an item by itself after the description of the other general work, and before such items as boundary or other walling.

In Mason, if not elsewhere described, commence with the rough stone, such as templates and corbels and follow on with the thresholds, sills, copings, internal pavings, staircases, hearths and chimney pieces. Then the external paving, steps and curbs. If the walls are built or faced in stone, describe these first completely, with all the labours, mouldings and ornaments on them, and then follow on with the rough stones and internal items, and finally with the external items, such as paving steps and curbs. It is not necessary to keep all stone of a similar nature under the one heading, unless it should happen to come in that order.

The Trades of Carpenter and Joiner are often separated. In a large work it is better to do so, but in a small work certainly keep them together. It is however immaterial whether they are separated or not, as long as the descriptions are clear. In the following order of items the Trades are kept together.

Lintels, bressummers, posts, cradling, floor and ceiling joists and plates, sound boarding, roof and flat timbers, felt, battens, gutters, and all external joiner's work to the roof or flat (except windows, doors and skylights), such as rolls, fascias, barge boards and such like items.

Then would come quartered partitions, followed on with flooring, windows, skylights, external doors, internal doors, framed partitions, skirtings, dadoes, wall and ceiling panelling, staircases, w.c., sink and bath casings, and other internal fittings such as shelves, cupboards and such like domestic fittings.

Items such as fencing, weather boarding, or other outside work, should be kept by themselves and come last.

Half timber work with all its attendant items might come after the description of the rough timbers.

It is not essential to separate hard woods from soft woods, but describe them as they come to each separate story.

In Smith and Founder take this order, lintels, chimney bars (but chimney bars are better taken in Bricklayer), straps (straps are better taken in Carpenter with the parts to which they belong), girder work, columns, stanchions, roofs, carriages, iron windows, gutters, stack pipes, external railings and gratings, stoves and ranges, and heating. Heating and Ventilation may however come as a separate item under Heating Engineer.

Under Slater and Tiler, describe the roofs first, then the vertical slating or tiling, shelves, cisterns and such like smaller items.

In Plumber, take this order, gutters, flashings and other roof finishings, flats and their gutters and finishings, then drinking water supply pipes cisterns, sinks, lavatories, baths and fittings. Then w.c. supply pipes, cisterns, w.c's., slop sinks, urinals and fittings, soil and ventilating pipes, and hot water circulation last.

In Zincworker and Coppersmith, take this order, flats, gutters and finishings, pipes and lightning conductors.

In Plasterer, describe first the general plaster work to ceilings, partitions and walls, and follow on with cornices, coves and centre flowers. Then those parts in cement, and finally the external plaster or cement work, or if preferred take the external work first.

Glazier—External glass to skylights, windows, doors, then internal lights and screens and pavement lights last.

Painter and Paperhanger—Internal work to ceilings, walls, wood and ironwork, and polishing. Then external painting to wood, iron and cement work. These Trades may however be separated.

As to the order in the Trades of Bellhanger, Gasfitter and Electrical Engineer, which are not as a rule of any considerable extent or variation, there is very little to suggest, but keep the order of the work such as the main items first and fittings afterwards.

It might be mentioned that the order adopted in a Bill of Quantities is not precisely the same in all its parts as that of a Specification. The order in a Bill of Quantities is placed to an extent to facilitate the pricing, and the order in the Specification should be to distinguish quickly the position of the work.

If the prices in the Bill of Quantities are not to be taken into account in the settlement of extras and omissions, or if quantities have not been supplied, then a Schedule of Items should be provided for the Builder to price, and this should be attached to the Specification and form part of the contract upon which variations may be valued.

The position of a Bill of Quantities in relation to a Contract is this. It may either form the Basis of the Contract or not. When it does, it implies that only the actual work taken in the Bill of Quantities is to be done for the Contract Amount, and any shortage in the quantities or omissions will be extra, and must be paid for as such. But when a Bill of Quantities does not form the Basis of the Contract, then the Specification and Drawings alone show the amount of work to be done, and as long as work is specified or shown by these documents, no extra can be claimed for any shortage in the quantities or for any omitted item.

ITEMS OFTEN OMITTED IN A SPECIFICATION.

Having now given the various points which are necessary to be observed for efficient Specification writing, a few matters may be mentioned which are worthy of attention, and which are not always found to be stated clearly in a Specification, and are sometimes omitted altogether.

Taking Preliminary Items first, always state that the plant and temporary erections are to be removed when directed, such as the scaffolding, hoarding, shoring, Clerk of Works Office and any other items of a temporary nature. A provision for these items is usually inserted in the Specification, but their removal is not always provided for.

State if the Hoarding is not to be let to an advertisement contractor.

Clearly define the meanings of Prime Cost and Provisional Amounts.

State if the Employer's business is to be carried on during building operations.

Mention that the Contractor is to give due facilities to other Tradesmen who may be employed on the premises, and also that the Contractor is to allow such other Tradesmen the use of his scaffolding and plant.

State to whom any coins or curiosities found on the premises or during the excavations are to belong.

If the Contractor has done any work previous to signing the Contract, then embody this work in the Contract, otherwise an extra may be claimed for some small items, which at the time of signing the Contract were understood to be included in the Contract amount.

Excavator—Where the foundations in a length of walling are not all one level, the excavation should be in steps and not on the rake. It should be stipulated that there should not be any excavations for ballast or sand except where necessary for the actual excavations of the building, as this may affect the stability of the structure.

Specify that brick rubbish be put under surface concrete which is to receive wood block flooring or paving; there will then be less liability of damp coming through. In clay soils the foundations should be taken down to a depth beyond the influence of the weather. This may necessitate the foundations being taken down some 4 ft., 5 ft. or 6 ft. below an otherwise good bottom. And note that test holes must be dug to ascertain the nature of the stratum upon which a building is to be erected before the foundations can be properly described. Specify a proportion of coke breeze, slag, or gypsum in concrete for fire-resisting construction. It will the better resist the action of fire.

State that all foul earth and cesspools are to be removed, the space around disinfected, and the excavations filled up with clean rubbish or concrete.

Encase new drain pipes in concrete. If a slight settlement occurs, there will be less likelihood of the joint opening. Half channels in manholes are better formed in cement than with half pipes. A cleaner flow of sewage is thereby obtained.

Then as to the items under Bricklayer do not forget to mention these points:—To tie in the walls. To build external walls hollow if possible, but in damp situations certainly, and specify the lead covering over the heads of doors, windows or arches coming within the hollow space. This will prevent the wet being communicated to the inner thickness of the hollow walls. Describe a weather joint externally to brick walls.

Build the brickwork up in even heights and flush up the joints. Let the sand be free from dirt and the water clean. Sea water and sea sand may be used where dryness is not essential. Build chimney stacks in cement where they appear above the roofs, either in part or in whole from the top downwards, preferably the latter. Build all parapet walls and the brickwork immediately under the eaves in cement for a certain distance down, and a damp course in this position and to the chimney stacks will not be amiss. Half brick walls should of course be built in cement. Boundary fence walling should have a damp course and proper footings and foundations.

In retaining walls against earth, do not omit the weeping drains or other device for taking off the water accumulated at the back.

Smoke flues should not be too large, 9 in. × 9 in. is sufficient for most fireplaces, and the brickwork should be gathered quickly over the fireplace openings.

All stoves should be built in solid, and the boxings to chimney pieces filled up. Fires have often occurred through neglect of these precautions.

A straight joint should be made between connecting walls and a heavy tower, and a large chimney shaft should not be attached to the main structure.

Mason—Stone templates should be of considerable area and be tooled and not left rough. In fact any stone upon which work is built should be tooled as a least labour on it.

Do not forget the cement packing between the rivet heads on the top of flange girders and the cover stone.

Stone hanging steps are preferably placed in position and pinned in after the building is up, sand courses being left in the brickwork for this purpose.

In stone columns or pilasters the apophyges should be worked on the shafts, the effect being much better.

Portland cement will stain delicate marbles and some of the limestones.

Carpenter and Joiner—When possible use wood block flooring for the lowermost floors next the ground. The ordinary joists and flooring in this position are more liable to decay. In this latter case the joists and plates should be of oak.

Put cast-iron shoes or stone bases to all solid door frames.

Bed window sills on to the stone sills in white lead, and do not omit to specify the iron tongue.

The cleats to roof trusses and the horns on solid door frames are sometimes forgotten.

Snow boards to roof gutters will often prevent wet penetrating when the snow melts; and snow guards will prevent damage to glass roofs.

Casement windows should open outwards by preference in order to keep wet out.

The ends of timbers where bedded in walls should have a circulation of air around them.

A little sap on the edges of timber exposed to the air will not be a great source of weakness, and it will not be likely to affect the rest of the timber.

All gutters should be wide enough to walk along. Small angle fillets at the junction of horizontal and vertical planes of a roof flat, will make better work than if the leadwork be turned up sharply. This remark will also apply to lead gutters.

In some cases it is almost preferable to put a prime cost amount for the ironmongery to each door, window or other fitment, and to select the furniture afterwards.

Slater and Tiler—Tiles and slates without boarding under should be torched.

Smith and Founder—Let rain-water pipes stand out about 1 in. clear of the walls.

Plasterer—Timbers over 3 in. wide should have the arrises taken off before the lathing is nailed on, thus obtaining a better key for the plastering.

The walls at the backs of skirtings or any other woodwork should be plastered over to prevent vermin harbouring.

The outside of all flues near woodwork and where in the roof, should be roughly rendered over. This will be a preventive against fire.

Single laths should not be lapped at the joints as is often done.

Plumber and Gas Fitter.—The exhaust pipe to the hot water circulation and to the heating arrangements must not be forgotten.

All hot and cold water pipes should be kept well away from each other, and from the influence of frost.

All pipes, whether gas or water, should be readily accessible, and if possible should be on the face of the walls.

The furring up of hot water pipes is chiefly found between the boiler and the circulating cylinder or tank. This portion of the piping should be easily accessible for cleansing.

All horizontal gas pipes should be laid with a fall, to prevent any condensed liquid remaining in any part of the pipes, and thereby affecting the efficiency of the gas supply.

It is a good plan to fix all pipes about $\frac{3}{4}$ in. clear of walls, especially hot water pipes.

The hot water supply and the heating arrangements should not be worked from the same boiler, as failure is almost certain to result.

Glazier—All glass subject to jars should be bedded in wash leather or indiarubber as well as in putty.

One of the best methods for glazing wood skylights is to seat the glass on a bedding of putty, and then to sprig it in and to paint the joints over with the woodwork of the bars. It is perfectly watertight and there is no putty on the weather side to get out of order. This plan is much adopted in horticultural buildings, both vertically as well as to the top light glazing. The laps of the glass to skylight top lights should be cut to a curve, the water being thus directed down the centre of the glass and away from the rebates in the bars.

Painter—External painting will give a more satisfactory result if done in the Spring or Autumn.

No painting, papering or other decoration should be done while there is a suspicion of dampness about the building.

All ironwork should be well painted over before it is buried or covered up.

Here is a suggested Form of Outside Cover for a Specification.

SPECIFICATION OF WORKS

TO BE DONE AT

No. 3 EASTLEIGH ROAD, CROYDON,

FOR

JOHN SMITH, Esq., OF WOODSIDE LODGE,
GRANGE ROAD, BEDFORD.

Mr Ralf Robinson,
Architect,
26 Plaistow Buildings,
London, N.W.

January 1904.

Date of completion, 9th March 1905.
Insurance effected up to 9th September 1905.
Works to be kept in repair up to 9th September 1905.

Note.—Fill in the above particulars correctly. It is a good plan to make notes in red ink on the outside cover of a Specification, of the "Date of Completion," the "Date the Insurance expires," and the date up to which the "Works are to be kept in Repair." These matters are apt to be forgotten.

SPECIFICATION OF WORKS

to be done for

John Smith, Esq., of Woodside Lodge, Grange Road, Bedford, in pulling down the EXISTING BUILDINGS known as No. 3 EASTLEIGH ROAD, CROYDON, and in erecting upon the Site entirely NEW BUILDINGS, together with various OUTHOUSES, PAVINGS and FENCINGS, and in performing certain ALTERATIONS and REPAIRS to the Adjoining Premises, under the superintendence of

Mr RALF ROBINSON,

Architect,

26 Plaistow Buildings,

London, N.W.

January 1904.

General Scope of Works. The Works embraced by the Contract consist mainly:—

In clearing the Site of the Existing Structures.

In erecting an entirely new House, together with various Outhouses, Pavings and Fencings.

In Alterations and Repairs to the Adjoining Premises.

Note.—Fill in all the foregoing particulars correctly. If a short general description of the Works be given, it will greatly assist a Contractor in grasping quickly the general scope of the Works. It might also be stated if the Site is some distance from a Railway Station, as also if the approach to the Site is uphill.

List of Contract Drawings and Documents. The following is a list of the signed Contract Drawings and Documents:—

No. 1. Block Plan.
No. 2. Ground Floor, Basement and Cellar Plans.
No. 3. First and Second Floor Plans.
No. 4. Roof Plan.
No. 5. Elevations.
No. 6. Sections.
No. 7. Various details.

The Specification of Works including:—

- The Conditions of Contract.
- The Schedule of Prices (in case there is no Bill of Quantities provided to act as a Schedule of Prices).
- The Tender.
- The Agreement.

The Bill of Quantities (whether it forms the "Basis of the Contract" or acts merely as a Schedule of Prices).

Note.—Fill in the correct list of Drawings and Documents.

GENERAL CONDITIONS.

Here would follow the Conditions of Contract, referred to under General Notes as those clauses embracing the terms upon which a Contract is given. These are as previously mentioned fully treated in a separate work, "Macey's Conditions of Contract," and in the same work are treated those parts of the Preliminary Items where they contain a penalty for non-observance of some matter. All this matter being strictly legal is out of place in the present work.

Here is, however, a list of the principal items embraced by the Conditions of Contract:—

Definitions of Terms.

How to fill up the Form of Tender and Schedule of Prices.

Bill of Quantities when it either forms or does not form the Basis of the Contract.

Prime Cost Amounts, Provisional Sums and Insurance.

Contractor to provide everything, including watchman and guards, to make allowance for all contingencies, to remove all obstacles from the Site, to set out the Works, and to make good all damage to Property and Persons, and to provide Sureties.

Works to be under Contractor's charge.

Hoarding, Fencing, Shoring.

Insufficient or improper Materials, Plant or Men.

Best Materials and Workmanship. Samples of Materials, Vouchers for Materials.

Accommodation for Men and Materials, Wages to be paid Men, Class of Workmen. Vaccination of Men. Foremen.

Works to be done in accordance with Drawings and Specification.

When Drawings and Specification do not agree.

Contractor to conform to all Acts of Parliament, and to give all notices and pay all fees, and not to deviate from the Drawings or Specification.

Sub-Contractors.

Date of Completion. Extension of Time. Keep Works in Repair.

Contract not to be assigned.

Bankruptcy of Contractor or Employer.

Work to be done to Architect's approval.

Architect may vary work, suspend work, dismiss men, and make tests.

Architect to be sole Judge.

Plans and Specification to be property of Architect.

Clerk of Works and Assistants of Architect.

Payment and default of Payment.

Certificates.

Arbitration.

Forms of Agreement, Tender and Schedule of Prices.

PRELIMINARY ITEMS.

The Preliminary Items apply generally to the various trades.

When a new building has to be erected upon the site covered by an existing building, it is sometimes customary to engage a separate contractor, known in the trade as a "House Breaker," to pull down and remove the existing building; at the same time selling to him the old material. According to the value of the old material, there may be a credit due from the House Breaker to the Employer, or vice versa. A description of the work when let separately in this way will be found under clause No. 80.

Nature of work.

(1)—The work consists mainly in clearing the site of all existing structures, and erecting a new building, together with outhouses and stables, and laying various new pavings and drainage.

Give a short general description of the work comprised in the specification, it will assist a contractor in grasping quickly the requirements.

Locality.

(2)—The site is situated (e.g.) within three miles of the St. Neots Railway Station on the Great Northern Railway, and the approach is mostly uphill.

State the nearest railway station if the work be in the country, as cartage may have to be taken into account.

Contractor to visit site.

(3)—The contractor shall visit the site, and make himself thoroughly acquainted with the nature and requirements of the case, so that no item may be omitted from his estimate, although not specifically mentioned in detail.

Dimensions not shown.

(4)—Where the scantlings or dimensions of work are neither specified, nor shown on the drawings, they will be settled by the architect.

Contractor to read conditions.

(5)—The contractor shall read through the Conditions of Contract, and allow a price in his estimate for any condition or item he may deem necessary.

Special work.

(6)—The contractor shall allow for any additional expense to which he may be put owing to the special nature of the work, the mode of execution, and the time of completion.

Estimate to be in several amounts.

(**7**)—The estimate shall be made up in (say) three separate amounts. The several and individual works to be included under each of these amounts are specified under three separate headings, as sub-specifications. The Conditions of Contract, Preliminary items, general clauses, and the general clauses and descriptions of work and compositions of materials mentioned under any trade, are to be taken as referring equally to each of these separate sub-specifications. The estimate is to include for all work done previously to signing the contract. (Or put a sum for this last item.)

This clause saves the repetition of many general items and descriptions, when the nature of the work is similar, but under distinct headings.

Date of completion.

(**8**)—The building shall be completely finished, fit for occupation by (say) the first day of January 1905, or such other time as the architect may allow in writing, owing to any special circumstances occurring. If the works be not completed by that date, or such other date as permitted by the architect, then the contractor shall pay and allow the employer the sum of (say) £5 per day as agreed and liquidated damages, for every day during which the work remains incomplete. Delay consequent upon fire, strikes, lock-outs, combination of workmen for their own ends, and force majeure only excepted, and in such case the architect shall determine such extension of time.

Note.—Fill in the correct date of completion and the amount of damages. Sometimes specific dates are mentioned for different portions of the work; such as, the foundations to be in by a stated time, the joists to each floor to be on by other stated periods, and the roof to be covered in by a further date, and so on. Damages vary in amount according to the importance of the work.

Payment.

(**9**)—Payment shall be made upon the certificate of the architect at the rate of £80 per centum upon the value of the work executed and fixed in position, until the completion of the work; when an additional £15 per centum shall be paid, and the remaining £5 per centum shall be paid at the expiration of six months after the date of the architect's certificate that the whole of the work has been completed.

According to the nature of the work the percentage of the payments may vary, as also the period in which the balance is held in hand.

Keep Works in repair.

(**10**)—The work shall be kept in repair for a period of six months after the date of the architect's certificate of completion; and any damage, defects, stains or imperfections of whatever description that may arise during that period, owing to carelessness, defective workmanship or materials, shall be made good at the contractor's expense.

Usually the time varies for keeping the work in repair from three to twelve months.

Insurance. (**11**)—Insure the works in an approved office at builder's risk, against fire to the amount of (say) £3000, until the building is roofed in, when the insurance shall be increased to the full amount of the contract, and kept insured in that sum until the architect's certificate of completion has been received. The policy shall be taken out in the joint names of the contractor and the employer, and be deposited with the architect.

Note.—Fill in the correct amount of insurance. If the work consist only of additions to an old building already insured to an amount which would cover the cost of the new erection, then the insurance company will only require that an extra building risk insurance be taken out upon the amount already insured.

Acts. (**12**)—The work shall be done in conformity with the London Building Act, 1894, Amendments and Bye-Laws, and in conformity with any Local Acts and Bye-Laws, and to the satisfaction of the London County Council, the District Surveyor, or any Local Surveyor to an Authority.

If the work be not within the area of the County of London, then it will only require to be done in conformity with Local Acts and to the satisfaction of the District Council and any Authorities to such district.

Notices and fees. (**13**)—Give notice to the County (or District) Council, Borough Council, district surveyor, parish, local or other authorities and officers, as well as to the gas, water and electric current supply companies. Obtain all licences and consents, and pay all their fees.

If the building be within the area of the County of London, then the superficial area of the building, together with the number of floors in height, should be mentioned for the contractor's guidance in estimating; the fees to the district surveyor being calculated on that basis.

Task work. (**14**)—No part of the work shall be let out as task work, nor sub-let to other persons, unless upon the written authority of the architect.

When work is sub-let by a contractor, it is often scamped by the sub-contractor, and it is very difficult for the employer to obtain redress.

Contractor to make copy of plans. (**15**)—The contractor shall, at his own expense, make copies of all drawings, specifications and details required for the work. Due facilities will be afforded him for this purpose.

This clause is required when the architect, for some special reason, does not supply the contractor with copies of the plans and specification.

Foreman and copies of plans. (**16**)—An approved and competent foreman shall always be kept on the works while in progress, and he shall keep copies of all drawings, detail drawings, specifications, letters and other instructions at the works.

When superintending the works, it will be found of great assistance to be able to refer to these documents.

Materials, labour, cartage and lodgings. (**17**)—Provide all materials, labour, carriage, cartage, hoisting, fixing, plant, tackle, tools, water, temporary plumbing and tanks, machinery, engines, mortar mills, wheel-barrows, mortar-boards, tarpaulins, templates, boats, and temporary planking. Erect good and sufficient gantry, fender, fans, staging and scaffolding, with braces, struts, boards, planks, ledgers, putlogs, cords and ladders. Include for men's lodgings, travelling expenses, and all things necessary for the proper and complete execution of the works. Remove all surplus material and plant as and when the architect shall direct.

Men's lodgings and travelling expenses are only required when a town contractor is employed to do work in the country, or vice versa.

Quality of Materials and workmanship. (**18**)—The materials, articles and workmanship shall be of the best quality and execution. The word "best" as applied to materials, articles and workmanship shall mean that in the opinion of the architect there is no superior material or article in the market, and no better class of workmanship.

Materials referred to without a full description. (**19**)—Any material or composition of materials described under one trade and only referred to under another trade, shall be similar in quality and composition.

This will save describing similar materials more than once.

Measure materials in boxes. (**20**)—Materials requiring the addition of water to form the various compositions specified, shall be first measured separately in boxes of selected sizes, then mixed dry, and water added afterwards.

Storage of materials. (**21**)—The method of bringing all materials on the ground, and the position in which they shall be stacked, shall be decided by the architect, and suit the convenience of the employer.

The employer may wish to carry on his business during the execution of the work.

Framing. (**22**)—The framing and putting together of all work, such as carpenters, joiners, masons, bricklayers and other trades, shall be approved by the architect before being executed.

Details. (23)—Full sized details with detailed instructions shall be supplied the contractor for various parts of the work; the contractor shall apply for and obtain these particulars before putting the work in hand.

Stock mouldings and articles. (24)—No stock mouldings or stock articles shall be used unless expressly specified to be so.

This clause would apply when it is not intended generally to use stock mouldings or articles.

Attend upon all trades. (25)—Attend upon, cut away for, and make good after all trades, in and by all trades, including forming and cutting all holes and chases, cutting away for and making good after plumber, gas-fitter, hot-water, sanitary and electrical engineers, and every other tradesman or sub-contractor employed on the premises.

It may be beneficial to the work to let certain trades separately.

Temporary sheds. (26)—Erect temporary sheds for the men to work under, and for their accommodation at meal-time, and for the protection of materials, and remove when directed by the architect.

Latrine. (27)—Provide a temporary latrine for the use of the workmen, keep it clean, empty when required, disinfect, and remove completely when directed by the architect.

Clerk of works' office. (28)—Provide a temporary timber-framed office for the use of the Clerk of Works, (say) 12 feet square, made up with studding, external weather boarding and internal matched boarding, with felt (or silicate cotton) filled in between, and properly secured, lighted, ventilated, floored and roofed, and supplied with approved grate and chimney. Allow for firing and attendance; a suitable desk with two drawers, locks and keys; stool, hat-pegs, lavatory, and dry earth closet and urinal, and shift and remove where and when directed by the architect; and allow (say) £3 for other office instruments and requirements.

A Clerk of Works is not always engaged upon a building.

Lights and watchmen. (29)—Provide for all lights, beacons, guards, barriers, day and night watchmen; and allow for all other safeguards and precautions for the prevention of accidents and losses.

A night watchman is not always required.

Coke and braziers. (30)—Provide coke, firing and braziers in every room and other part of the building for a period of two months' time of 24 hours per day, to assist in the drying out of the work. But care shall be taken not to damage the work.

When work is in a great hurry this provision is sometimes essential.

Smell of paint. **(31)**—Provide pans filled with clean water and chopped hay, to assist in taking off the smell of paint.

This may be necessary for a quick occupation of the premises.

Overtime. **(32)**—Provide for candles, lights, and men working overtime if found necessary, so as to complete the work by the contract time.

Architect's tests. **(33)**—The architect shall have liberty, to make all tests necessary to satisfy himself, that the materials and workmanship of every kind are in accordance with the specification. All labour and materials, together with a set of scales and weights and other appliances for this purpose, shall be supplied and allowed for by the contractor as part of the works; such as for removing, weighing, repairing and making good after the architect shall have broken, cut into or damaged the work, when testing at any time the materials, work or other parts of the building, either before or after the same has been fixed.

If there be a question as to the weight of glass, lead or other materials, this clause will be found useful.

Hydraulic tests. **(34)**—Attend upon and allow for all hydraulic, and such other tests as the Surveyor to the Board of Trade shall from time to time require.

This is a very special item, and would refer more to engineers' work coming under the Board of Trade.

Analyst's fees. **(35)**—Allow the p.c. sum of (say) £10 for analyst's fees for testing the quality of cement, paint or other material. The contractor shall add to this amount for his own profit, and for the supply and carriage of the samples required by the analyst.

Protect work from injury. **(36)**—Cover up and protect from injury, all stone, brick, tile, terra-cotta and other work, including all wood and ornamental work. Put tile pieces to stone steps and stairs, and wood pieces to wood stairs. Box up hand-rails, newels and chimney-pieces. Case up all reveals and mouldings.

Cover up walls. **(37)**—Cover up walling and other work during night-time, frost or inclement weather with straw (or felt) and wood planks laid on top. Make good all injury from whatever cause to every part, more especially after injury from frost to the pointing of brick, stone, terra-cotta or other work.

Tarpaulin roof. **(38)**—Cover over the old building where the roof has to be removed, with a tarpaulin and skeleton scaffold-framed temporary roof as a protection to the walls from wet, and put side sail cloths and fixings as a precaution against annoyance of dust to the adjoining owners; and remove when directed by the architect.

This provision is necessary when an existing roof is removed, either for renewal, or for the addition of a new story.

Board up adjoining owner's rooms. (39)—Board up, canvas and line with stout lining paper the exposed sides of rooms both to the employer's and the adjoining owner's premises, and keep out the weather. Remove boarding when directed by the architect.

This work is necessary when party walls are removed, and sometimes when additions are made to an existing building.

Hoarding. (40)—Provide, erect and maintain a suitable and sufficient hoarding (say) 8 ft. high, with cart and wicket gates, locks, fastenings and three keys (one being for the use of the architect), together with a bell and letter box. Form planked footways, post and rail fence and fender, to the satisfaction of the Borough Council or Local Authorities, for one length of (say) 50 ft., with two return ends of (say) 5 ft. each. Remove when directed by the architect. Note.—The hoarding shall not be let to an advertising contractor; but the employer reserves to himself the right of doing so.

Note.—Fill in correct lengths of hoarding and footways. Hoarding is mostly required in towns and cities; the height and distance out in the public way are regulated by the Local Authorities.

Fence in site. (41)—Enclose the site with an approved temporary post and rail fence, with gates and fastenings, as a precaution against workmen trespassing upon the adjoining properties; and remove when directed by the architect.

Necessary in some parts of suburban towns, or in the country.

Shoring. (42)—Shore up to the satisfaction of the Local Authorities and the architect, all party and other walls, floors, roofs, partitions and other parts where directed both to the buildings on the site, and to those adjoining, and remove all such shorings as and when directed by the architect. The shoring to consist of all requisite dogs, hoop iron, hooks, rakers, sole pieces, wall pieces, braces, struts, needles, cleats, wedges and posts. The shores to be of fir timber, the wall pieces and braces of deal, the needles, cleats, wedges and sole pieces of oak. All timber in the public way to be limewhited 10 ft. up every two weeks.

This is a general clause, but if it be necessary to describe the shoring in detail, which is the correct way, the following notes will assist in specifying the various parts to each set of shores.

Raking shores may be at angles of 60° to 75° with the building, but 40° is the best angle if obtainable. Each set of shores may be 12 ft. to 15 ft. apart.

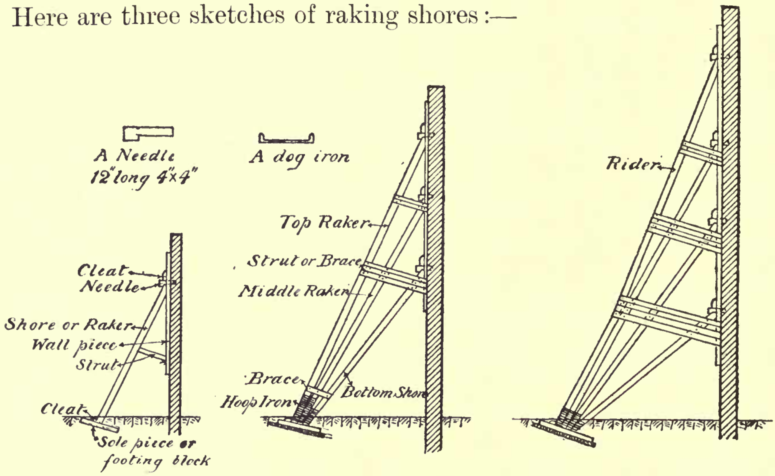
Walls	15 ft. to 30 ft. high	require	2	raking shores in each set.
„	30 ft. „ 40 ft.	„	3	„ „
„	40 ft. and upwards	„	4	„ „

The sizes of the rakers to—

Walls	15 ft. to 20 ft. high	may be	4 in. × 4 in.	or	5 in. × 5 in.
„	20 ft. „ 30 ft.	„	9 in. × $4\frac{1}{2}$ in.	„	6 in. × 6 in.
„	30 ft. „ 35 ft.	„	7 in. × 7 in.		
„	35 ft. „ 40 ft.	„	6 in. × 12 in.	„	8 in. × 8 in.
„	40 ft. „ 50 ft.	„	9 in. × 9 in.		
„	50 ft. and upwards	„	12 in. × 9 in.		

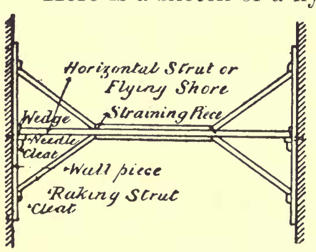
The sole piece should not be quite at right angles to the shores. The top needle should be at least 2 ft. down from the top of wall. The braces may be 1 ft. × 6 in. (to 9 in.) timbers, and placed just below the needles. The wall piece should be 3 in. thick and of a similar width to the shore.

Here are three sketches of raking shores:—



When the top raker cannot be obtained in one length, the lower part of it may be at a different angle to the top or "rider" part, the joint being wedged with oak.

Here is a sketch of a flying shore:—

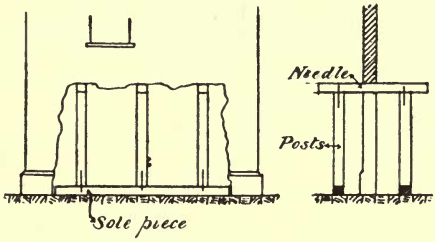


Flying shores may be spaced from 10 ft. to 15 ft. apart, with spans up to 33 ft., and placed three-fourths up the height of wall. If the span be greater, then pitch pine must be used for the horizontal strut, as it is difficult to get Dantzic fir in greater lengths than about 33 ft. Flying shores are employed for supporting a wall when there is a wall opposite from which to shore.

Flying shores 15 ft. span require 6 in. × 4 in. principal struts, with 4 in. × 4 in. rakers.

Flying shores 15 ft. to 33 ft. span require 6 in. × 6 in. to 9 in. × 9 in. principal struts, with 6 in. × 4 in. to 9 in. × $4\frac{1}{2}$ in. rakers.

Here is a sketch of needle shoring supporting a wall while being underpinned. The needles may be about 12 in. square fir timbers, with similar posts and sole pieces. Distance of the needles apart, from 5 ft. to 7 ft. Rolled iron or steel joists may be employed in place of fir needles, when the wall above is especially good.



Facilities to other contractors.

(**43**)—The contractor shall give every facility and assistance to other tradesmen employed on the premises, and shall allow them the use of his plant and scaffolding; but the contractor shall be responsible for the management of the work, and for his work fitting in with the other tradesmen's work.

This clause applies when some of the trades are let separately.

Carrying on employer's business.

(**44**)—The contractor shall give every facility to the employer for carrying on his business upon the premises during the alterations, and the contractor shall interfere with it as little as possible.

Such as with shops, hotels and other business premises.

Workmen not to wander about premises.

(**45**)—The workmen shall not wander about the garden, or about the house in any part, except where absolutely necessary for the alterations; and the contractor shall make special provision to enforce this rule.

Inventory.

(**46**)—Allow for an auctioneer's fee and costs for taking an inventory with the employer's representative of the furniture and fittings in the house at the time of signing the contract, and for adjusting the statement upon the contractor giving up the works. Any article found damaged or missing shall be renewed or reinstated at the contractor's expense. The contractor shall store up in the building the furniture and fittings mentioned in the inventory, and cover up and protect them from injury and damp.

In additions and alterations to premises, it may be convenient to the employer not to warehouse the furniture.

Take down old buildings.

(**47**)—Take down the whole of the old buildings, sheds and erections, together with all fence, party and other walls, take up all pavings and other obstacles found on the site and clear away: but certain of the old buildings and walls shall be left standing until the architect orders their removal.

This clause applies when an old building is entirely or partly removed.

Grub up old foundations.

(48)—Grub up all old foundations to existing buildings, and fill in the excavations with hard dry brick rubbish (or concrete), well rammed, so as to get a firm bed for the new work. Any curiosities, old coins, money or articles having a monetary or intrinsic value, other than building materials, shall be delivered up to, and become the property of the employer.

This clause applies where new foundations come upon the site of any old foundations removed.

Make good new work to match old.

(49)—Take down partitions, walls, floors, roofs, and take out windows and doors where required for the purpose of the alterations. Cut all openings for new doors and windows, and make good to old portions of all walls, ceilings, cornices, plaster, floors, skirtings, parts and finishings, and decorate to match the existing work.

This clause refers to buildings only partly removed.

Cut, tooth and bond, and prepare surface of old walls for new.

(50)—Cut, tooth and bond all new work to old. Level, sweep, clean, prepare and wet the surfaces of the old walls before building the new work upon them. Level the face of old walls, and cut off all projections before building against them.

This clause refers to buildings only partly removed.

Old bricks reused.

(51)—Clean, sort and stack old sound bricks, these may be reused in the foundations and internal walls, if approved by the architect.

This clause refers to buildings wholly or partly removed.

Old materials reused.

(52)—All stone sills and thresholds, all sashes, doors and all other old materials and articles may be reused, if dressed up, repaired and made out, and approved by the architect. Sort and stack all these sound old materials.

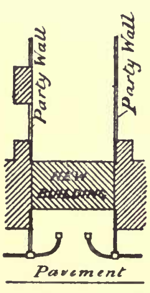
When the contractor is allowed to use in all suitable old material.

Clear away.

(53)—Clear away all old materials, dirt, rubbish and superfluous matter and materials as they accumulate.

New building set back from adjoining old buildings.

(54)—Where the party walls of the adjoining premises are laid bare owing to the new building being set back (or removed altogether), they must be made good as required, and rendered over in Portland cement $\frac{3}{4}$ in. thick; and all other parts made good to the satisfaction of the adjoining owners and the architect. Alter and rebuild the front garden party fence walls and railings.



The sketch will show when this clause is required. The walls may perhaps only require pointing in cement if fairly good.

Adjoining owners. (55)—Make good to the adjoining owners' buildings, sheds or structures to their respective satisfaction.

Parish property. (56)—Alter, relay and make good the borough or parish pavement, road metalling, kerbing, channelling or other work disturbed, to the satisfaction of the Borough Council or Local Authorities. Lay all new pavements, metalling, kerbing, channelling and work, so as to make out up to the new building line as set back; or pay the Borough or Local Authorities for doing this work.

When borough or parish property is disturbed, or where buildings are set back, as shown by the sketch under clause No. 54.

Make good gravel paths and grass. (57)—Make good the gravel to the paths and yards where disturbed, and spread clean binding gravel over where damaged by cart or other traffic. All turf to be relaid, and beds replanted where damaged in any way. Alter the paths, lawns and garden beds to suit the extension of the building.

When private grounds are disturbed.

Leaks and damp. (58)—Search with the employer's representative during storms of rain and after snow, for any leaks in the roofs or other parts of the building, repair and remedy all such defects, which if not found and remedied may be a cause of damage in the future.

Water-tight. (59)—Leave the premises water-tight at completion, and free from damp in every part.

Ballast. (60)—Any ballast or sand found during the excavations, shall be used if required and if approved by the architect. And the value of such shall be determined by the architect and deducted from the contract amount. But no ballast or sand shall be excavated on the site, other than that necessitated by the excavations for the building.

Accounts in small items. (61)—In case of variations or extra work, the contractor shall render up his account in small and complete items, each complete item referring in its entirety to the special part of the work to which it belongs.

Priced bill of quantities. (62)—Before signing the contract, the contractor shall deposit with the architect a fully-priced-out copy of the bill of quantities, and all extras and omissions of similar work and description shall be valued at the prices therein set forth; but any item of extra work which does not exactly agree with the items in the bill of quantities shall be valued at a price as far as possible analogous thereto, at the architect's valuation. The bill of quantities shall form the "basis of the contract."

When a bill of quantities forms the "basis of the contract," it implies that if the quantities be short, then the contractor shall be allowed the deficiency when settling up his account; but if, on the other hand, they be too full, then the difference will be deducted.

When a bill of quantities does not form the "basis of the contract," but has been supplied merely as a document upon which the contractor may form his estimate, then the following additional sentence should be added to the above clause, and the sentence in that clause "the bill of quantities shall form the basis of the contract," be omitted.

The contractor shall satisfy himself, that sufficient has been taken in the bill of quantities, for everything necessary to carry out the contract in accordance with the specification, the drawings, the dimensions and the site.

A bill of quantities does not as a rule form the basis of the contract; neither is a bill of quantities always supplied.

Schedule. **(63)**—The contractor shall fill up the schedule of work and materials at the end of the specification, with the same prices upon which he based his tender; and all extras and omissions shall be valued at the prices therein set forth; and any item of extra work which does not exactly agree with the description in the schedule, shall be valued at a price as far as possible analogous thereto, at the architect's valuation. The contractor shall show his papers and calculations upon which he based his tender.

This clause should be inserted when a contractor takes out his own quantities, and no bill of quantities has been supplied.

Return specification. **(64)**—The specification, together with the schedule of work fully priced out, shall be returned to the architect on the day of sending in the tender; or the deposit of £3. 3s. will be forfeited, and the tender will not be considered.

A deposit from the contractor is often required to show his "bona fides," and is of course returned to him upon receipt of his tender with the specification.

Prime costs. **(65)**—A prime cost or p.c. amount as applied to the value of articles shall mean, the actual net amount paid by the contractor to any tradesman selected by the architect, after the trade and every other discount has been deducted, except a bona fide cash discount; and the vouchers and receipted bills showing the amounts paid for the articles specified shall be produced. The contractor shall add to the prime cost or p.c. amounts, for labour, carriage, fixing and his own profit. A prime cost or p.c. amount relates to the price of the article delivered in London (or other town, or at the place of manufacture). Should a prime cost article, owing to its unfinished state or to the material of which it is formed, require painting or decorating to match the other work, then the contractor shall also allow an amount in his estimate as will compensate him for such additional outlay. The contractor shall not be allowed any extra amount for fixing an article which may incur a greater cost than that ordinarily required.

Provisional amounts. **(66)**—Provide the sum of (say) £100 for additional work, to be used in part or whole if required, and deducted in part or whole as not used. It is to be understood that in adjusting a provisional sum, no allowance shall be made the contractor for the use of his scaffolding or plant. The contractor shall be allowed 10 per cent. profit out of provisional sums other than prime cost or p.c. amounts; but should the nature of the work to which a provisional sum refers, require painting or decorating to match the other work, then the contractor shall allow such extra amount in his estimate on to the provisional sum provided, as will compensate him for such additional expense.

Thus, suppose a provisional sum refers to iron mantelpieces, then under this clause the painting would not be taken into account when settling the account for this work.

Extras may vary from 2½ per cent. to 10 per cent. of the total estimate. Fill in what is considered sufficient to cover.

Lithography. **(67)**—Allow the sum of (say) £5 for lithography, which shall be paid by the contractor upon signing the contract.

The correct amount will be obtained from the lithographer.

Quantity surveyor's fees. **(68)**—Allow an amount of 2½ per cent. upon the total estimate for Quantity Surveyor's fees; such amount shall be paid by the contractor to the Quantity Surveyor as the work proceeds upon the amount of the architect's certificates, but half the total amount shall be paid out of the first certificate.

Quantity surveyor fees vary according to the class of work, from 1½ to 2½ per cent. It is better to let the employer pay the fees direct.

Scrub floors. Clean pavings. Clean out under floors. **(69)**—Twice scrub all floors and clean all pavings at completion. Before the boarded floors are laid, clear out all rubbish, shavings and dirt, both from ground and upper floors.

Clean windows. **(70)**—Clean all windows inside and out at completion.

Leave premises clean. **(71)**—Leave the whole of the premises clean at completion.

Ferrying. (72)—The contractor shall employ his own boatmen to ferry the men across to and from the work, from and to the shore twice (or three times) daily at meal times.

The work may be on an island, or in the case of a fever hospital away from the mainland. Sometimes the committee of a hospital employ their own boatmen.

Vaccination. (73)—The contractor, and all workmen employed by him on the buildings, shall be re-vaccinated at the contractor's expense, before entering upon the works and after the contract has been signed.

Usually required with work done to small-pox hospitals. The vaccination is generally paid for by the Managers of the hospital.

Boiler work under Board of Trade. (74)—Perform the work required in the construction and fitting of the boiler, in conformity with the Board of Trade regulations; and in such a manner that the boiler, when fixed and finished, will pass the Board of Trade survey.

This clause modified would apply to any work under the Board of Trade.

Credit old material. (75)—The contractor shall show what amounts he will allow as a credit for the old materials, whether reusable or not. (See clauses Nos. 51 and 52.)

Similar work executed in two materials. (76)—The contractor shall state for what additional amounts he will execute the main staircase in oak instead of in deal; and the stone facings and ashlar work in Portland stone in lieu of Bath stone.

Separate amounts may also be required for covering the flats with lead instead of zinc; or building the brickwork in cement mortar instead of lime mortar, or for any other alternative requirement.

This clause might perhaps come under the trades to which the items in it would severally apply.

Lay bare walls. (77)—Lay bare from all covering, all walls, for the architect to decide what work shall remain.

Submit samples. (78)—Samples of all materials and articles shall be submitted to the architect for approval and none shall be used which are disapproved.

(79)—

House Breaker.

See remarks preceding clause No. 1, referring to a "House Breaker."

(80)—Specification of work to be done in shoring, and in pulling down and clearing away from the site, the existing buildings known as (give the name and situation of property), for (give the name and address of the employer), under the superintendence and to the satisfaction of (give the name and address of the architect).

Hoarding. Provide and erect a suitable and sufficient hoarding (say) 8 ft. high, well and securely fixed together, with cart and wicket gates, locks, fastenings and three keys, one being for the use of the architect. The hoarding is to run for one length of (say) 50 ft., with two return ends of (say) 5 ft. Refix the name-plate of the occupier.

Note.—The hoarding is not to be let to an advertising contractor; but the employer reserves to himself the right of doing so.

Clause No. 40 would, under these circumstances, be modified when inserting it in the contract for the rebuilding, or else omitted.

Pull down and remove. Pull down, and cart away from the site, the whole of the existing buildings, erections, walls, floors, roofs, back additions, sheds, pavings, vaults and fittings, to the level of the ground underneath the lowermost floor. Well sprinkle the work with water when pulling down so as to lay the dust.

Also see clause No. 47. State if any of the old walls or other parts are to remain.

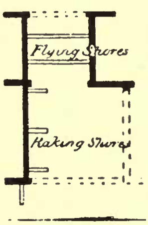
Grub up. Grub up all foundations, search for and grub up all drains, cesspools, foul earth and offensive matter, and remove from the site.

Also see clause No. 48. A "House Breaker" will not always undertake to do the work mentioned in this latter paragraph.

Fittings. The employer reserves to himself certain fittings, as scheduled below. The contractor is to store up such fittings on the premises where directed, and to put a protection over and around the same. (Then give the list of fittings to be kept.)

Sometimes fittings are valuable, and the employer may desire to retain certain of them.

Shore up.



Shore up the adjoining premises with shores of such size and construction as shall be directed by the architect, the following being a list of the shores: (say) four raking shores to the west party wall, one shore being placed in the street; and (say) two flying shores between the back flank walls. Limewhite the shores in the street 10 ft up every two weeks. The contractor to whom the contract is given for rebuilding the premises is to have the use, wear and tear of the hoarding and shoring for a period of (say) twelve months, free of charge. Remove hoarding and shoring within (say) twelve months, at such time as the architect shall direct.

If it be required to describe the shoring more in detail, see clause No. 42, with notes. State if the hoarding and shoring is to become the property of the employer; and in the contract for rebuilding, mention the fact that it is there, and that the contractor is to allow for it.

Notices. Give notice to District (or Local) Surveyor and Borough (or Parish) Authorities and pay their fees; and execute the pulling down, the shoring and hoarding to their requirements and satisfaction.

Read clauses Nos. 2, 3, 17, 38 and 39, which, when modified, may perhaps be necessary to include, especially clauses Nos. 38 and 39.

Damages. It is to be distinctly understood that time shall be of the essence of this contract, and the contractor agrees to pay and allow the employer the sum of (say) £2 per day after the (fill in date of completion of work), for every day during which this contract has not been fulfilled.

The contractor takes upon himself the liability for all damage that may happen to the adjoining owners' premises, or to any person or animal, owing to the work under this contract; and hereby agrees to make good all such damage, and to indemnify the employer from any claim which he may sustain on that account. The contractor shall have no claim against the employer, should he not receive back the same amount of hoarding or shoring as he fixed.

Agreement. I am willing to perform, free of charge, the aforementioned work upon the terms, conditions and stipulations herein mentioned; and I further agree to pay the employer upon his acceptance of this contract the sum of (say) £20 in purchase of the old material.

Witness— (Signature of "House Breaker.")

Address.

Date.

A "House Breaker" will generally allow something for the old materials, but, if they be of little value, he may remove the old buildings free of charge; or, on the other hand, he may require the employer to pay him a small amount.

When there is no payment to be made to the "House Breaker," then there may be a question as to his carrying out his contract in its entirety. It is well under these circumstances to require him to deposit an amount with the architect, as security against this contingency. Or a clause may be inserted in the contract stating that, should he not complete his contract to the satisfaction of the architect with regard to the amount of work to be done, then he agrees to pay all costs which may be incurred by the employer in calling in some other person to complete the work in question.

DRAINAGE.

It is not proposed in this work to treat upon the disposal of sewage, the construction of sewers, or the sewerage of towns, as these subjects come more within the scope of the engineer.

When possible drains should be laid outside a house, there is then less chance of sewage air arising in the building. The plan given under clause No. 35, however, shows them inside, in order to illustrate the difficulties to be contended with.

House Drainage.

Brick barrel drains.

(**1**)—State the size, if built in mortar (or cement), and if rendered inside in cement.

Brick barrel drains are never now used for house sewerage. They may be used for water courses if desired.

Brick barrel drains are built:—

9 in.	diam. with half a brick ring,	
12 in.	" "	
15 in.	" "	
18 in.	" "	or a one-brick ring.

Generally and Testing.

(**2**)—Immediately the concrete foundations to the walls are formed, the drainage is to be laid, and protected during the progress of the building from falling materials. It is not to be covered up until the architect shall have inspected, tested and passed the work as satisfactory, as shown by his written authority. The drains in the ground will be tested by filling each separate length of piping with water, before they are encased in the concrete (if they are encased in concrete), the joints being left perfectly free all round, and unless the pipes hold water without any loss, they are to be taken up and relaid. The drains are not to be walked upon until they are encased with concrete (or covered over with earth 2 ft. deep).

Gradient.

(**3**)—The pipes to be laid to true gradients from point to point, with a fall of at least 1 ft. in 40 ft., and not more than 1 ft. in 30 ft. The bends to have a fall of 3 in. in their several lengths. The arrows on the plan show the direction of the falls.

When a gradient of 1 in 40 cannot be obtained, a flushing cistern must be provided, see clause No. 47, with notes.

Trenching out ground for pipes, and tunnelling.

(4)—Trench out ground for pipes to true hanging lines (gradients), and ram the bottom to form a solid and even bearing. Part fill in and ram, and part cart away. Perform any tunnelling for pipes.

It is sometimes cheaper and safer to tunnel than to excavate. If the ground is very loose, ramming is no good, in that case concrete must be laid as a foundation.

Excavations for manholes and traps.

(5)—Excavate ground for the several manholes, turning and inspection chambers, gullies and traps; part fill in and ram, and part cart away.

Planking, strutting and staging.

(6)—Perform all requisite planking, strutting and staging to sides of excavations, and keep excavations free from water.

Lime.

(7)—See Bricklayer, clauses Nos. 4 to 6.

Lime is seldom if ever now used in drainage work.

Cement.

(8)—See Excavator, clause No. 23.

Sand.

(9)—See Excavator, clause No. 24.

Ballast.

(10)—See Excavator, clause No. 25.

Lime mortar.

(11)—See Bricklayer, clauses Nos. 9, 10, 12 and 13.

Lime mortar is seldom if ever now used in drainage work.

Cement mortar.

(12)—See Bricklayer, clause No. 14.

Bricks and brickwork.

(13)—See Bricklayer, clauses Nos. 3 and 17, modified.

Lime concrete.

(14)—See Excavator, clauses Nos. 28 to 30.

Lime concrete is seldom if ever now used in drainage work.

Cement concrete.

(15)—See Excavator, clause No. 27.

Labours.

(16)—Perform all holes, chases, sinkings, cutting, underpinning, sailing courses, and other labours.

Arches.

(17)—Turn rough arches in one half-brick ring in cement mortar over drain pipes where passing through or under walls.

Dimension of pipes.

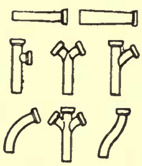
(18)—The sizes of the pipes specified, signifies the internal diameters. Stoneware pipes to have a thickness of at least one-twelfth of their internal diameter.

Salt glazed stoneware drain pipes are made 2 in., 3 in., 4 in., 6 in., 9 in., 12 in., 15 in. and 18 in. internal diameters in 2 ft. lengths; the 12 in., 15 in. and 18 in. pipes being also made in 2 ft. 6 in. lengths; the sockets are additional to the length of the pipe in each case.

Internal diam. in inches.	Thickness in inches.	Length of Socket in inches.	Total Length of Pipe in feet.
2 in.	$\frac{5}{16}$ in.	$1\frac{1}{2}$ in.	2 ft. $1\frac{1}{2}$ in.
3 „	$\frac{3}{8}$ „	$1\frac{1}{2}$ „	2 „ $1\frac{1}{2}$ „
4 „	$\frac{9}{16}$ to $\frac{5}{8}$ „	$1\frac{1}{2}$ „	2 „ $1\frac{1}{2}$ „
6 „	$\frac{5}{8}$ to $\frac{11}{16}$ „	$1\frac{3}{4}$ „	2 „ $1\frac{3}{4}$ „
9 „	$\frac{3}{4}$ „	2 „	2 „ 2 „
12 „	1 „	$2\frac{1}{4}$ „	2 „ $2\frac{1}{4}$ „ and 2 ft. $8\frac{1}{4}$ in.
15 „	$1\frac{1}{4}$ „	$2\frac{1}{4}$ „	2 „ $2\frac{1}{4}$ „ 2 „ $8\frac{1}{4}$ „
18 „	$1\frac{1}{2}$ „	$2\frac{1}{2}$ „	2 „ $2\frac{1}{2}$ „ 2 „ $8\frac{1}{2}$ „

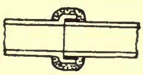
Pipes may also be obtained 21 in., 24 in. and 30 in. diameters, in $2\frac{1}{2}$ ft. and 3 ft. lengths, but these sizes are more required for town sewerage.

Stoneware drain pipes and jointing.



(19)—The drain pipes to be "tested," salt glazed inside and out, hard, sound, stoneware, whole-socketed pipes, circular in cross section, perfectly straight, free from flaws and projections, and matched before laying in trenches. Put all bends, tapers, junctions, Y's and other connections. Square junctions only to be used where specially described.

Cement joints.



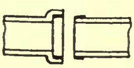
The pipes to be jointed together in neat Portland cement. First wipe out clean, all dirt from the spigot and socket of each pipe, then fill in the space between with neat Portland cement; wipe clean the inside with a damp cloth, and draw a close-fitting pad through each pipe as it is laid.

Form round each joint on the outside, a band of neat Portland cement $1\frac{1}{2}$ in. thick by 3 in. wide.

This is the usual method of jointing stoneware pipes, but the ring of cement round the joints on the outside of the pipes is not always done.

or,

Patent jointed pipes.



The stoneware pipes to have patent composition joints. First wipe out clean, all dirt from the spigot and socket of each pipe, then apply hot with a brush, a preparation of $2\frac{1}{2}$ (to 3) parts of Russian tallow to 1 part of resin (or hot boiled oil) to the joints, and set the pipes in place with a twist; wipe the inside clean with a dry cloth, and draw a close fitting pad through each pipe as it is laid.

Form round each joint on the outside, a band of neat Portland cement $1\frac{1}{2}$ in. thick by 3 in. wide.

This form of joint is considered very satisfactory; the pipes can be tested a few hours after being laid.

Acid pipes.

(**20**)—The pipes to be glazed acid pipes, jointed with sulphur and clay dust.

This class of pipe may be used in chemical works. State if a ring of cement is to be formed round the outside of joints, as in clause No. 19.

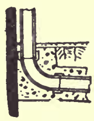
Encase pipes in concrete.

(**21**)—All drain pipes to be encased in cement concrete 4 in. thick, a space being dished out at every joint for the sockets, so that the pipes may have a firm bearing throughout their whole length.

Encasing drain pipes in concrete makes by far the best work, as it prevents the pipes sagging and the joints becoming broken. But frequently, when the drains are outside a building, they are merely laid on a bed of concrete 4 in. to 6 in. thick, and 8 in. wider than the external diameter of the pipes.

Drain pipes are also laid with the concrete formed up to two-thirds the height of the pipes. But inside a building they should always be encased in concrete.

Bed feet of vertical pipes in concrete.



(**22**)—The bend in the ground at the foot of all soil, rain-water, ventilating and other vertical pipes, to be bedded in solid concrete.

Open channels.

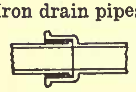
(**23**)—The open channels (or half-pipes) passing through the manholes, to be special white glazed stoneware pipes set in concrete, with the sides formed up vertically in concrete 5 in. above the lip of the pipes, and the benches worked up to the sides of the manholes at an angle of 30°, and then rendered over in $\frac{3}{8}$ in. neat cement, with the arris slightly taken off.

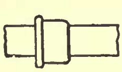
The half-pipe channels to have a fall of 3 in. in their several lengths.

See sketches under clause No. 37, for channels and benches.

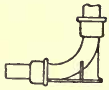
The channels or half-pipes in the manholes may be formed up entirely in the concrete, and rendered over in neat cement; and perhaps this is almost the better way, as the cement can be more easily manipulated to the necessary curves required for a cleaner flow of the sewage. In this case the beds of the channels would all intersect.

Iron drain pipes.





(**24**)—The iron drain pipes to be laid in 9 ft. lengths, and be coated inside and out with Dr Angus Smith's (or a similar) solution (or painted inside with two coats of oil paint). All projections on the inside of the pipes to be carefully chipped off and filed down.



Iron Shoe with foot piece

Pipes 4 in. diameter to weigh 54 lbs. per yard.
„ 5 in. „ „ 72 lbs. „
„ 6 in. „ „ 91 lbs. „

The pipes to be jointed, by inserting in the socket of each pipe a ring of tarred yarn (oakum), leaving $1\frac{1}{2}$ in. space in depth, which is to be run in with lead and caulked up with proper caulking tools.

Iron drain pipes are made $1\frac{1}{2}$ in., 2 in., $2\frac{1}{2}$ in., 3 in., $3\frac{1}{2}$ in., 4 in., $4\frac{1}{2}$ in., 5 in., 6 in., 7 in., 8 in., 9 in., 10 in. and 12 in. diameters, with similar bends, junctions and tapers as with stoneware pipes. They are made in 9 ft., 6 ft. and 3 ft. lengths, exclusive of the depth of the socket which to a 4 in. pipe is 4 in. more; to a 5 in. pipe $4\frac{1}{2}$ in.; and to a 6 in. pipe $4\frac{1}{2}$ in. The diameter of the socket to a 4 in. pipe is $5\frac{1}{4}$ in.; to a 5 in. pipe $6\frac{1}{2}$ in.: and to a 6 in. pipe $7\frac{1}{2}$ in.

In loose or marshy ground, and soils subject to river floods, iron pipes will be found beneficial, as the jointing will be more secure and the joints less in number. To gain a firm bedding, the joint ends of each length of pipe should be placed upon concrete piers about 18 in. to 2 ft. square, taken down if possible to the solid stratum. Iron pipes may also be encased in conçrete or else be laid on a bed of concrete, as clause No. 21. Dr Angus Smith's solution is a preparation of tar. Pipes 5 in. diameter are suitable for the majority of main drains to buildings, with 4 in. branches. Iron drain pipes may, in certain positions, be laid along the walls of a building; or in trenches similar to hot-water heating pipes, see Bricklayer, clause No. 36.

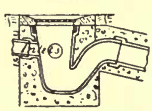
Brickwork to manholes and chambers.

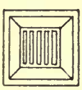
(25)—The specified sizes of manholes and chambers refer to inside dimensions.

Execute the brickwork to manholes and chambers with stock bricks (blue, gault or local bricks), laid in cement mortar on footings, and 6 in. (to 9 in.) cement concrete foundations. The concrete to project 4 in. on either side beyond the lowest course of footings. Point the brickwork on both sides with a flush struck joint as the work proceeds.

In best work manholes are often faced inside with white enamelled bricks, or they may be rendered over in cement.

Gullies.

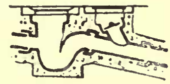




(26)—The gullies to be in salt-glazed stoneware, 8 in. square on top, with 4 in. outlet, and 4 in. inlet lugs as required, and bedded in concrete 4 in. thick.

Each gully to have a 9 in. × 9 in. × $\frac{1}{2}$ in. (or $\frac{3}{8}$ in.) cast-iron grid, let into an 18 in. × 18 in. × 4 in. cut, rebated, rubbed (or tooled) and dished hard York stone kerb.

If possible, a gully trap should always have a sink waste discharging into it, so that the water in the trap will not be liable to evaporate in dry weather. When a gully is some distance from a manhole, it may have a cleaning branch with cap, and a small iron plate on top let into a rebated York stone.



Treatment of ironwork. (**27**)—Paint all ironwork to manhole covers, steps and gratings three times in oil.

or,

All ironwork to manhole covers, steps and gratings to be made rustless by Professor Barff's (or a similar) process.

or,

All ironwork to manhole covers, steps and gratings to be galvanised.

Professor Barff's process of making iron rustless is considered to be efficient for a time. It consists in covering the surface with a magnetic oxide.

The following clauses, Nos. 28 to 35, would only be necessary when laying new drainage to an old building.

Grub up and fill in. (**28**)—Search for, and trace out all old brick and other existing drains, traps, cesspools, rat runs, and offensive earth and matter, grub up and cart away as it accumulates. The architect may require any part of the premises to be excavated for this purpose. After disinfecting, fill up the excavations with clean earth (brick rubbish or concrete). Care to be taken, when excavating, not to undermine or affect the stability of the building.

Take out old fittings. (**29**)—Take out all existing closets, lavatories, sinks, baths, cisterns, pipes and other fittings.

Take up pavings and floors. (**30**)—Take up all pavings, floors, joists, concrete and other work necessary for the laying of the new drains.

Disconnect existing sewer connection. (**31**)—Disconnect existing drain from main sewer at the junction of the premises with the parish property, and seal up in cement concrete.

Sometimes the existing connection with the sewer is utilised in the new work, if that be the case, state so.

Clean and flush out old drains. (**32**)—The existing drains that remain are to be cleaned out and brushed through with dry lime.

Or the drains may be cleaned out and flushed with lime water.

Relay floors and pavings, and make good other work. (**33**)—Relay all disturbed tile, asphalt, stone and cement pavings, wood floors, floor joists and concrete, and make out with new.

For a fuller description of cement floors, yards and areas, see Pavior, clauses Nos. 7 to 9; asphalt floors, see Pavior, clause No. 7; tile and brick floors, yards and areas, see Pavior, clauses Nos. 2, 3 and 7 to 9; wood block floors, see Pavior, clause No. 4; stone paving to areas, see Mason, clause No. 41; stone paving to rooms and passages, see Mason, clauses Nos. 42 to 44 and 46; wood flooring to rooms, see Carpenter, clauses Nos. 58 to 71.

Relay turf and gravel.

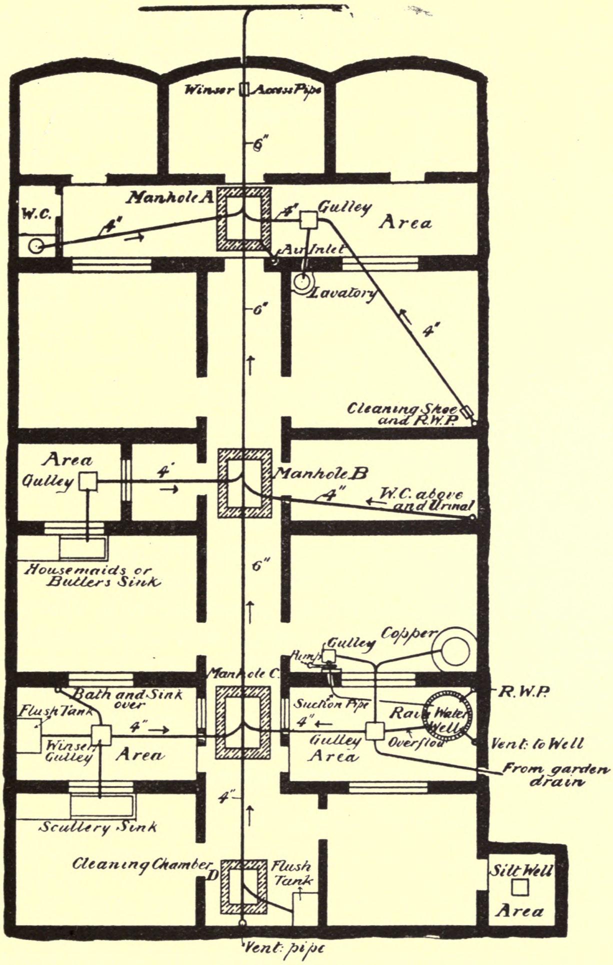
(34)—Relay all turf and gravel, and make good all beds disturbed.

Clause No. 57 under Preliminary Items may be modified and inserted here instead.

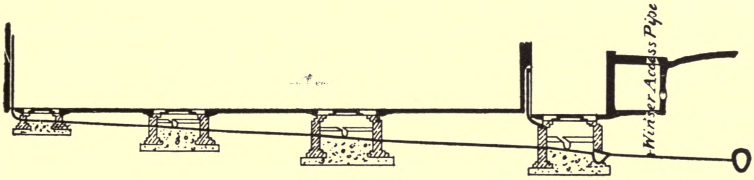
Make good paint, paper and other works.

(35)—All paint, paper, colouring, whitewash, skirtings and other work injured or disturbed, to be made good.

Clauses Nos. 35 to 48 refer more especially to the plan and section below.



PLAN



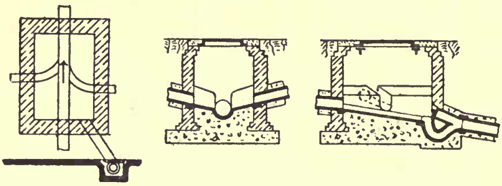
SECTION

Connect with sewer.

(**36**)—Give notice to Borough (or Local) Authorities, and pay their charges for connecting with the public sewer and inserting a well-balanced galvanised iron flap block for a 6 in. drain, and carrying a 6 in. stoneware drain encased in concrete to the boundary of the property, and making good the road metalling, channelling, kerbing and footpath. Continue this 6 in. stoneware drain encased in concrete from the public connection to manhole A, with an access pipe at the boundary for testing this length of piping, and seal up.

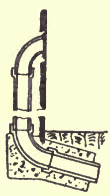
Disconnecting manhole A.

(**37**)—Build manhole **A** 3 ft. 6 in. × 2 ft. 6 in., in 9 in. brickwork in cement, on footings and concrete, line inside with white enamelled bricks, second quality, and flat joint point. Put a 6 in. glazed stoneware syphon intercepting trap, having a 4 in. cleaning branch and cap. Bed in the concrete one 6 in. half-pipe 3 ft. long, and two 4 in. half-pipe bends; form up the sides and benches in concrete, and render over in $\frac{3}{8}$ in. neat Portland cement with the arrises slightly taken off.



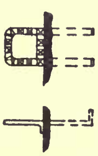
Sometimes a 4 in. syphon trap is used with a 4 in. cleaning branch and cap, but having a 6 in. outlet to sewer. In this case a 4 in. to 6 in. taper half-pipe must be used, connecting the 4 in. trap to the 6 in. main drain coming into the manhole.

Air inlet.

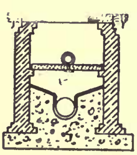


Take a 6 in. air inlet pipe in concrete, carried up in area wall 4 ft., and finish with a 12 in. × 12 in. cast-iron grid (or finish with a mica flap).

Oversail for, and cover manhole with a 24 in. × 18 in. heavy cast-iron cover and frame, with india-rubber seating and gun-metal lock and key, let into a 12 in. × 5 in. (or 4 in.) cut, rebated, tooled (or rubbed) hard York stone kerb, and supported on two 3 in. × 3 in. × $\frac{3}{8}$ in. T-iron bearers. Build into walls four heavy cast-iron steps (usually fixed about every 12 in. down).



A mica flap is of little practical use as it soon gets out of order. Iron steps are not necessary with a shallow manhole. The half-pipes are fully described in clause No. 23, and the treatment of the ironwork in clause No. 27.



If an inner cover be also required to the manhole, describe it as a $2\frac{1}{2}$ in. tooled hard York inner stone cover, bedded in mortar on oversailing courses, with a 4 in. diameter drop ring, and the space above filled in with sand. Enamelled bricks are commonly called glazed bricks.

For iron pipe drainage, an inner manhole cover is manufactured by various makers. By this means as by the method of employing an inner stone cover the pipes are shut down close on the top, but accessible at any time. The covers are made in two forms, either with the pipes and bends in the manhole all cast in one piece with the cover to fit; or else as a close-fitting iron cover by itself, suitable for covering over the ordinary stoneware half-pipes in a manhole.

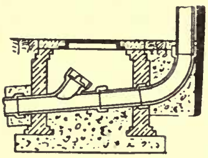
Manhole B.

(38)—Build manhole B 3 ft. × 2 ft. 6 in., in a precisely similar manner in every way as manhole A, but omit the syphon trap and air inlet.

Manhole C.

(39)—Build manhole C 3 ft. × 2 ft. 6 in., in a precisely similar manner in every way as chamber B, but with a 6 in. to 4 in. taper half-pipe instead of being straight.

Cleaning Chamber D.



(40)—Build chamber D 2 ft. × 2 ft. at head of drain, in a precisely similar manner as manhole C, but omit the half-pipes. Insert a 4 in. cleaning branch and cap.

6 in. main drain.

(41)—Connect manholes A to B and B to C, with 6 in. stoneware pipes encased in concrete.

The class of pipes and description of concrete will be found in clauses Nos. 18 to 20 and 24; and 21 and 22 respectively.

4 in. branch drains.

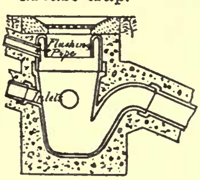
(42)—Connect manhole C to D with 4 in. stoneware pipes encased in concrete, and from manholes A, B, C and D to the various connections of w.c.'s, gullies, soil, flushing, ventilating and other pipes.

Gullies.

(43)—Put three gullies in areas, and one in wash-house under pump, bed in concrete, and finish with stone kerbs and iron grids, and connect to sink, lavatory, bath and rain-water pipes.

The full description of the gullies will be found in clause No. 26, and the treatment of the ironwork in clause No. 27.

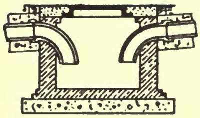
Grease trap.



(44)—Put outside to scullery sink a 12 in. flushing gully, with a stone kerb and grid similar to other gullies. (Let the flushing tank discharge into this gully, or else put another flush tank especially for it, see clause No. 47. All grease traps for the collection of grease are objectionable.)

If a chamber for the collection of grease be required, the description may run:—

The grease-trap chamber to be 2 ft. 6 in. × 2 ft., built



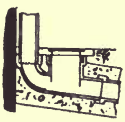
and paved in 9 in. enamelled brickwork in cement, on footings and concrete, and flush joint pointed. Put a 3 in. stoneware pipe inlet bend from sink (or inlet bends if more than one sink), and a 4 in. outlet bend to drain, with kerb and manhole cover similar to chamber **A**. The inlet and outlet bends to be kept up 12 in. from bottom of chamber. Insert a rubbed Portland (or York) stone tablet in the wall nearest the grease-trap chamber, with the incised lettering, "Clean out every month."

This form of grease trap is only for the collection of grease, and will not require to be flushed out, but must be cleaned out by hand.

When the grease trap for a large establishment is at the head of a long drain, this collecting chamber is almost absolutely necessary; but if it be near the main sewer, then a flushing grease-trap gully is suitable.

In a small establishment a flushing grease-trap gully is quite suitable, whatever its position.

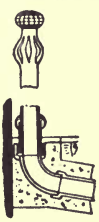
Shoes to rain-water pipes.



(45)—The rain-water pipe in the house, entering the gully in the area, is to have a stoneware shoe at the foot bedded in concrete, with a 9 in. × 9 in. × ½ in. close plate iron cover, let into an 18 in. × 18 in. × 4 in. rubbed (or tooled), cut and rebated stone kerb.

This form of shoe is required for cleaning purposes, when the rain-water pipe is some distance from a gully. If the rain-water pipe be in the open, but still some distance from a gully, the shoe may then have an open grid.

Ventilating pipe.



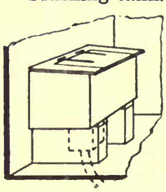
(46)—Carry up from the highest point of the drain an 8 lb. (or 10 lb.) per foot 4 in. diameter drawn lead ventilating pipe, with astragal band joints, and brass sole piece and 4 in. brass screw cap at foot. Continue the pipe up 5 ft. above parapet, stayed to roof with a ⅝ in. iron rod, and finished with an expanded pierced lead head, and copper wire rose on top.

or,

Finished with 3 ft. of copper pipe, with an expanded pierced copper head, and copper wire rose on top.

An iron pipe is frequently used for ventilating purposes, but, in time, the iron rusts and chokes the bend at the foot.

Flushing tank.



(47)—Put at head of drain 3 ft. above paving level, on 9 in. × 3 in. wrought deal bearers, with 9-in. brick bearers under, a 40 (50 or 60) gallon galvanised iron automatic flushing tank with syphon, and with a 4-in. stoneware pipe encased in concrete to drain. Enclose tank with 1 in. wrought deal, grooved and tongued casing, with lid, hinges and padlock, and pack round with hair felt 2 in. thick (or silicate cotton). Lay on

$\frac{1}{2}$ in. lead supply with stop-cock, and $\frac{1}{2}$ in. plug bib-cock discharging over tank with screw nozzle and cap having a pin-hole $\frac{1}{16}$ in. diameter bored in it.

A flushing tank is not absolutely necessary if the fall of drain be good, and there be plenty of water passing down it, but in cases where a drain has a fall of only 1 in 60, it may be said to be almost essential.

Silt well.

(48)—Form a silt well in small area, 12 in. square, 2 ft. deep, with a gravel base, concrete (or brick in cement) sides, and 9 in. × 9 in. × $\frac{1}{2}$ in. iron grid on top, let into an 18 in. × 18 in. × 4 in. (or 5 in.) rubbed (or tooled), cut, rebated, sunk, and dished hard York kerb.

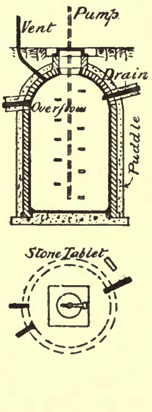
A silt well is simply a soakage pit for rain water, and may be used in small areas, when the expense would be too great to connect a gully with the main drain. In an impervious stratum it is not much good, unless it be made large enough to hold the rainfall taken by the area, and to allow it time to evaporate.

Rain-water drains.

(49)—See clause No. 52.

All rain-water pipes, sink, lavatory and bath wastes, and overflow pipes from wells, must discharge into a gully before being connected with the sewage drains.

Cesspool.



(50)—In the drainage of a country house where there is no public sewer, a cesspool may be provided, the description would run:—

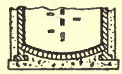
Build in 9-in. brickwork a circular cesspool in cement mortar, 5 ft. internal diameter, 8 ft. deep below the inlet, on footings and 6 in. cement concrete. Puddle round the outside with clay puddle 9 in. (to 12 in.) thick. Render the whole of the inside of cesspool in cement and sand in equal proportions $\frac{3}{4}$ in. thick, and finish in neat cement $\frac{1}{4}$ in. (or $\frac{3}{8}$ in.) thick, with the angle at the bottom eased off. (See Excavator, clause No. 7, for excavation.)

Dome over the top, and put an iron ring round the access hole, with an 18-in. diameter iron manhole cover let into a 3 ft. × 3 ft. × 4 in. cut, tooled, hard York stone kerb. Take a 6 in. (or 4 in.) stoneware ventilating pipe encased in concrete to the foot of the tree near, and carry up for 50 ft. carefully secured to the trunk, a 6 in. (or 4 in.) heavy galvanised (or otherwise treated) cast-iron pipe (or 6 in. or 4 in. diameter 10 lb. per super. foot drawn lead pipe) with galvanised iron (or lead) hood. Build in 9 in. × 4$\frac{1}{2}$ in. galvanised iron manhole steps every 12 in. down. Connect to cesspool with a 6 in. to 4 in. taper pipe, and take a 4 in. stoneware overflow pipe encased in concrete to a distance of 20 yards (more or less), and discharge into the ditch near, and finish with a galvanised iron movable grid.

Allow the p.c. sum of £4 for a chain pump.

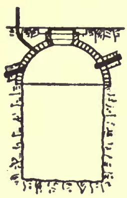
A pump may be useful when the liquids are required for garden purposes: the solids will have to be removed periodically. This class of pump is different from that which raises water from a well.

Build in ground 12 in. down in concrete near cesspool, a 24 in. × 9 in. × 4 in. rubbed hard York stone tablet, with the incised lettering "Clean out every year."

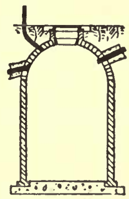


A cesspool is cleaner if not made too large. The bottom of a cesspool may be formed with an invert.

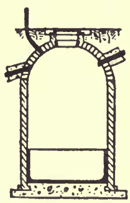
The description of house drainage will remain precisely the same when discharging into a cesspool, as when discharging into a public sewer.



In districts of chalk formation, cesspools are often formed without walls, being merely dug out of the chalk, and domed over on the top in brickwork in cement, with the manhole cover, kerb, ventilating and overflow pipes, similar to cesspools built in brickwork. The liquids percolate away into the fissures of the chalk, and ofttimes much of the solids.



In very loose and porous ground, when there is no chance of contaminating any water supply, cesspools may be "steined in," either ½ brick or 1 brick thick, that is, built dry without mortar or cement, in order that the liquids may percolate away. The top would be domed over in the usual way.



In this class of cesspool, the bottom and for about 20 in. upward may be built and lined in cement, the remainder being steined in dry. This will allow the solids to accumulate for some time, while the liquids are free to filter away.

Cesspools for the reception of sewage are generally built circular up to about 15 ft. deep, either dry or in cement (or lime) mortar, in half a brick thick when of the following internal diameters: 2 ft. 3 in., 2 ft. 9 in., 3 ft. 3 in., 3 ft. 6 in., 3 ft. 9 in., 4 ft., 4 ft. 6 in., 5 ft., 5 ft. 6 in. and 6 ft. With internal diameters of 8 ft., 8 ft. 6 in., 9 ft., 9 ft. 6 in., 10 ft., 10 ft. 6 in., 11 ft., 11 ft. 6 in. and 12 ft., they require to be one brick thick.

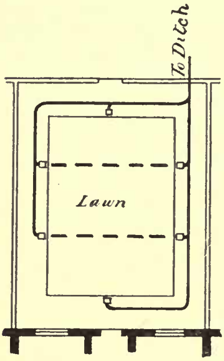
To find the cubical capacity of a circular cesspool, multiply the internal diameter in feet by itself, and then by ·7854, this will give the superficial area in feet; then multiply this result by the depth of cesspool in feet, this will give the cubical contents in feet; then multiply this result by 6·25 (being the number of gallons to a cubic foot), which will give the number of gallons the cesspool will contain; thus, take a cesspool 5 ft. diameter by 10 ft. deep—

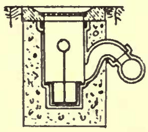
5·0	diameter in feet.
5·0	diameter in feet.
25·0	
·7854	
19·6350	superficial area in feet.
10·	depth in feet.
196·3500	cubical contents in feet.
6·25	number of gallons per cubic foot.
1227·187500	gallons, say 1227 gallons cubical contents.

Cesspools may be built with cement concrete 7 in. to 12 in. thick, and rendered on the inside in cement.

Drains to garden paths.

(**51**)—These may be described in a similar way to sewage drains, more especially in regard to clauses Nos. 2 to 19, 21, 24, 27, 34, 41, 42 and 48. Stoneware piping 4 in. diameter will generally be sufficient. It is not essential either to bed or encase the pipes in concrete. The fall may be 1 in 60. The garden gullies for collecting the water may be 9 in. or 12 in. stoneware gullies, with galvanised iron containers and 9 in. × 9 in. iron grids, let into 18 in. × 18 in. × 4 in. cut, tooled (or rubbed), rebated, sunk and dished, hard York stone kerbs. The water may eventually be conducted to some ditch, or else into the house drains, by discharging into a gully as in clause No. 43. Also see notes to clause No. 49.



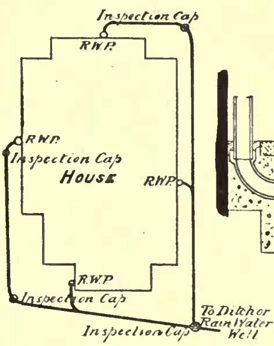


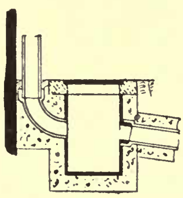
These gullies are made in 6 in., 9 in. and 12 in. sizes. The iron containers are to catch the solids washed off the paths. Garden gullies may be placed 15 ft. to 20 ft. apart.

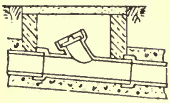
When a grass lawn is on an impervious soil, it should be drained with open-jointed pipes about 10 ft. apart leading into the path gullies, and the trench filled in above with broken brick or loose stones. Otherwise the lawn will remain damp for some time after rain. In a pervious soil these drains are not necessary.

Rain-water drains.

(**52**)—When there is a separate system of rain-water drains, the pipes would be described in a similar way to sewage drains, more especially in regard to clauses Nos. 2 to 19, 21, 24, 27, 34, 41, 42 and 48. Stoneware pipes 4 in. diameter will generally be sufficient. It is not essential either to bed or encase the pipes in concrete. The fall may be 1 ft. in 60 ft. Describe at the foot of each rain-water pipe a 6 in. stoneware shoe (without trap), with 4 in. outlet, 4 in. inlet lug and 9 in. × 9 in. × ½ in. iron cover plate, let into an 18 in. × 18 in. × 4 in. rubbed (or tooled), cut and rebated hard York stone kerb. Instead of stoneware shoes, small half-brick in cement catch pits may be built, about 12 in. × 12 in. × 18 in. deep, with inlet and outlet holes, and lined inside in cement, with the iron cover and stone kerbs on top (see the section above).

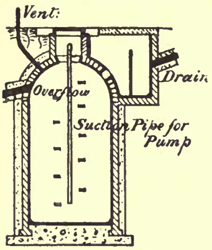


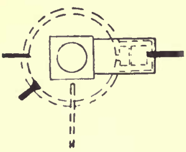




Inspection caps may be put in places for cleaning, with a small stone on top. The pipes may eventually be taken either to a ditch, or to a rain-water well or tank, as in clause No. 53. If taken into the sewage drain, they must discharge into a gully before being connected, as in clause No. 43. See notes to clause No. 49.

Rain-water well.





(53)—Build a 9 in. brick circular rain-water well in cement mortar, 8 ft. internal diameter, 10 ft. deep below inlet, on footings and 6 in. cement concrete. Puddle round the outside with clay puddle 9 in. (to 12 in.) thick. Render the whole of the inside in cement and sand in equal proportions $\frac{3}{4}$ in. thick, and finish in neat Portland cement $\frac{1}{4}$ in. (or $\frac{3}{8}$ in.) thick, with the angle at the bottom eased off. Dome over the top, and put an iron ring round the access hole, with an 18-in. diameter iron manhole cover, let into a 3 ft. × 3 ft. × 4 in. cut, tooled hard York stone kerb. Form inlet catch pit 12 in. square, line in cement, and supply with a movable brass (or gun-metal) strainer inside, with a 12 in. × 12 in. × $\frac{1}{2}$ in. iron cover let into a 20 in. × 20 in. × 4 in. cut, rebated, tooled hard York kerb on top. Build in 9 in. × $4\frac{1}{2}$ in. galvanised iron manhole steps every 12 in. down. Connect to well with a 6 in. to 4 in. (or 9 in. to 6 in.) taper pipe, and take a 4 in. (or 6 in.) stoneware overflow pipe (in or on concrete) to a distance of 20 yards (more or less), discharging into the ditch near, and finish at outlet with a movable iron grid. For excavation see Excavator, clause No. 7.

If the overflow pipe goes into the sewage drain, it must be taken into a gully, as in clause No. 43 (and see notes to clause No. 49), before being connected. The bottom of well may be formed with an invert. A ventilating pipe may be described, similar to that mentioned in clause No. 50, referring to a cesspool, but taken up only a few feet in height. The size of the well will be regulated by the quantity of water to be stored.

Allow the p.c. sum of £4 for a pump, and fix in wash-house. Take an $1\frac{1}{2}$ in. (or 2 in.) lead suction pipe bedded in concrete in the ground, down to within 12 in. of the bottom of well, stopped at the end, but pierced 12 in. up. For gully under pump see clause No. 43. See Plumber, notes preceding clause No. 21, and clause No. 57 in Plumber.

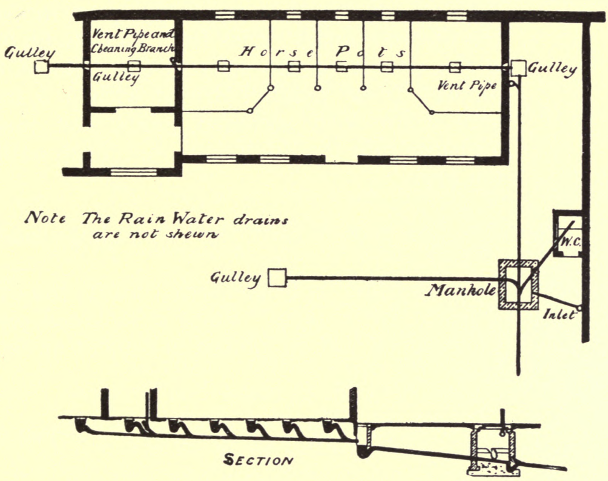
Circular rain-water wells may be built up to about 30 ft. deep, with the same diameters, and thicknesses of brickwork as described to a cesspool. See notes to clause No. 50. Concrete 7 in. to 12 in. thick rendered on the inside in cement, may be used instead of brickwork. In country districts, where there is no public water supply, storage tanks sh uld be made sufficiently large for a sixteen weeks' supply.

The mean rainfall over England	is about			31 in.
„	„	in London	„	25 in.
„	„	„ Manchester	„	38 in.
„	„	„ Plymouth	„	46 in.
„	„	„ Liverpool	„	28 in.

The greatest rainfall is in October and the least in April. See Plumber, notes preceding clause No. 21. For estimating the available amount of rainfall, see Bricklayer, notes preceding clause No. 114. For fresh-water wells, see Bricklayer, clause No. 111.

Rain-water tanks of shapes other than circular, would be built in a similar way as described in Bricklayer, clause No. 112.

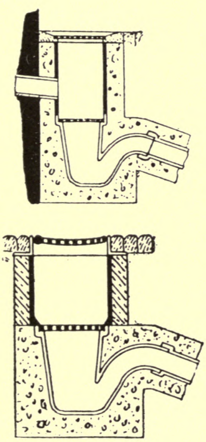
Stable drains. **(54)**—The drainage of stables is regulated by the paving, see Pavior, clause No. 12. If underground



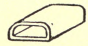
drains be used, the description would be similar to house drains, see clauses Nos. 2 to 19, 21 to 27, 36 to 50 and 52; and if in alterations, see clauses Nos. 28 to 35. The best method is to take a line of drains underneath the horse pots, with a cleaning cap and ventilating pipe at the top end, the bottom end being allowed to discharge over a large ordinary gully, as in clauses Nos. 26 and 43, with an inner movable grating to catch the straw. This gully would discharge into a disconnecting manhole, as clause No. 37, and from thence to the main sewer or cesspool. It is better to keep stable drains entirely separate from the house drains.

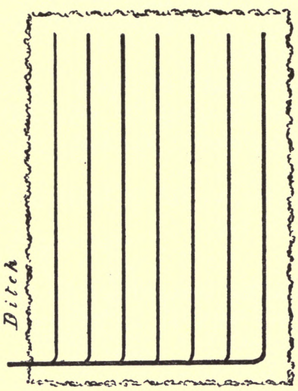
When stables have iron surface gutter drains only, they should eventually discharge outside with a flap, over a similar gully as that just described.

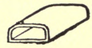
The gully in the stable yard should be large, with an inner grating, and a heavy hinged grating on the top.



Yard gully.

Agricultural drains. (55)—Agricultural drain pipes are made circular in section, and  shape. The circular pipes are made in 2 in., 3 in., 4 in. and 6 in. diameters. They are merely used for draining the stagnant subsoil water. The joints may either be open or with the upper half cemented.



The circular and  shaped pipes are made without sockets, in 12 in. lengths; the circular pipes are also made with sockets in 2 ft. lengths, similar to ordinary drain pipes.

The description may run thus:—

Trench out ground and lay 3 in. (or 4 in.) diameter 12 in. long earthenware subsoil drains 3 ft. deep (the depth varies from 2 ft. 6 in. to 4 ft. 6 in., according to the nature of the soil) every 15 ft. apart, in parallel lines (the distance apart varies from 15 ft. to 66 ft., according to the nature of the soil) to the falls of the ground. Connect these parallel drains with a 6 in. (or 9 in.) main drain with socketed joints and junctions, and discharge into the ditch near, and finish with a movable iron grid.

The circular pipes are mostly used, the other shape seldom if ever now.

If the moving surface water is to be carried away, the drain may be laid only about 12 in. to 18 in. deep. State if socketed pipes be used everywhere, and if the upper half be jointed in cement or clay. Subsoil drains may be laid:—

In tenacious clay,	with the	drains	15 ft.	apart at a	depth of	2 ft. 6 in.
In soft clay	„	„	21 ft.	„	„	2 ft. 9 in.
In clayey loam	„	„	22 ft.	„	„	3 ft. 0 in.
In friable loam	„	„	30 ft.	„	„	3 ft. 3 in.
In light loam	„	„	36 ft.	„	„	3 ft. 9 in.
In sandy soil	„	„	45 ft.	„	„	4 ft. 0 in.
In gravelly soil	„	„	55 ft.	„	„	4 ft. 3 in.
In loose gravelly sand		„	66 ft.	„	„	4 ft. 6 in.

(56)

(57)

(58)

(59)

Report on the Sanitary Condition of a House.

A report is merely a short description of a building, referring mostly to the defects. It is not a specification from which the suggested remedies may be carried out. The remedies may, however, be shortly stated.

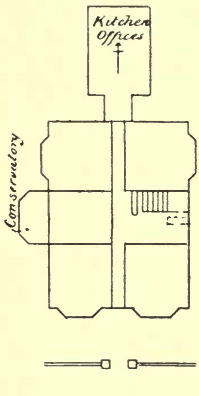
If the defects mentioned in a report be underlined, or written in italics, it will both shorten the report and make it more clear.

To W. Smith, Esq. 3rd January, 1904.

Report. (**60**)—In accordance with your instructions, I have visited No. 13 Talbot Road, Whitworth, and made a detailed survey both with regard to the aspect, the structure and the sanitary arrangements.

Note.—Fill in the correct name, date and locality.

Those portions of the report which I consider unsatisfactory are written in italics.



Aspect.—Taking the points of the compass: The front of the house faces due south, consequently the rooms would be hot in summer, and at times subject to much wet.

The rooms at the back, facing towards the north, will be somewhat cold in winter but cool in summer. With respect to the kitchen offices, all of which face towards the north, the aspect will be an advantage.

The rooms facing towards the east will be fairly warm in the morning and cool in the evening.

The rooms facing west will be fairly cool in the morning and warm in the evening.

The rooms generally are small. The middle room west has *no direct communication with the external air*, the casement windows opening into the conservatory. Two of the top-floor bedrooms *have no fireplaces.*

The position of the house is good, being situated on the slope of a hill. The roadway in front has a good gradient, and the houses opposite are a suitable distance off, and not of too great a height to impede the light and air coming from that direction. Round the other sides of the house there is a free supply of air and light, with the exception of the west side, where there are several tall trees. There are two railway stations near, but about five minutes off is *a cemetery and a factory.* The surrounding country consists mainly of woods, and consequently there may be a considerable amount of wet. The *soil is clay,* and would be somewhat damp and retentive.

Structure.—The structure is fairly well built, the walls are of brick and although somewhat thin, are about the usual thickness for this class of property, otherwise the house appears dry. The slating and leadwork to the roof are in good condition, but the timbers are of light scantlings. The floors are strongly framed. There is *no concrete* under the ground floor joists, but the floor is well ventilated. The joinery work is fairly good, but the *ironmongery is poor.* The plastering, painting and decorating *are in a bad state of repair.*

Refer to any other main defects that may be noticed when making the survey.

DRAINS.—The drainage is very defective. The pipes are of *earthenware* jointed with *clay,* and laid *under* the building. Many of the joints being open, the sewage has found its way through, and saturated the ground around. There is no *air inlet* or *siphon-trap* at the lower end of the drain before it enters the public sewer. A vitiated air-pipe exhaust is provided at the upper end, but of *insufficient* size, and the joints are mostly *open,* allowing the sewage air to find its way through the windows into the rooms near. The rainwater pipes do *not* discharge over open gullies, and the sink wastes *discharge direct* into the drains, but have a *small* lead trap under the sinks. The bath is of *zinc* and has *no* safe underneath, the waste discharging *into* the soil pipe.

There is *no* hot-water circulation.

The best w.c. is of the *old pan closet container* class, and the servants' w.c. is the *old long hopper,* both of these closets are of the worst kind.

The soil pipe is ventilated, but with *too* small a pipe.

The cistern in the roof is *open* and *without casing or safe.* It supplies the closets, baths and sinks, *all* from the one pipe, *without* any disconnection whatever.

The dustbin is in brick, just *under* the kitchen-window, and in a very bad state of repair.

RALF ROBINSON,
Architect.

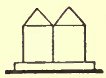
EXCAVATOR.

Clause No. 1 in Carpenter may perhaps preferably be inserted here.

The depth and width of the foundations to a building are governed by the nature of the soil upon which it stands; but the wider a foundation the better it is, in order that the soil may not be unduly loaded, and the weight of the structure more evenly distributed.

A foundation need not necessarily be deep if the soil be firm; and in some cases where the soil is soft, the less the natural surface is disturbed, the sounder will the building remain.

In made soils the foundations had better be taken right down to the natural soil; but in waterlogged soils, peaty and similar natural soils, it may be advantageous to form a plateau or table of concrete over the entire surface of the building site some 2 ft. to 4 ft. in depth, upon which the building may be erected without disturbing the surface in any way, otherwise a system of piling may have to be adopted, see clause No. 10. In clay soils the foundation must be taken down at least 4 ft. to 6 ft. below the surface, as clay when subject to the action of the weather is liable to crack, and cause the building to settle unequally. For the same reason foundations upon chalk must be treated in the same way. A concrete foundation under a building is only absolutely required when the building is erected upon naturally soft soils, "made soils," waterlogged and peaty soils, or quicksand (see notes to clause No. 32). For safe loads on various soils, see Bricklayer, notes preceding clause No. 115.



Strata. (1)—The excavation consists of a clay stratum, interspersed lightly with rock for a distance of some 4 ft., below which is a stratum of a more rocky nature.

State the nature of the ground for excavation, such as clay, gravel, chalk, sand or rock; the above clause being an example only. Trial pits will have to be dug to ascertain this.

Surface turf. (2)—Carefully remove the turf, preserve and stack for re-use by the employer.

This clause would refer more especially to a virgin soil.

Surface earth. (3)—Remove the surface earth to an average depth of (say) 15 in. over the whole site of the building, wheel and deposit where directed within 20 yards run (or cart away).

State if the surface excavation be more or less than 15 in., and if the run be more or less than 20 yards.

Vegetable soil. (4)—Separate the vegetable soil and deposit in a heap where directed.

Sometimes required for gardening purposes.

Basement and cellars.

(5)—Excavate the ground for basement and cellars to an average depth of (say) 9 ft. below turf level, wheel and deposit where directed within 20 yards run, (or cart away) but part return, fill in and ram.

The depth of basements may be more or less than 9 ft. If the excavation be in a confined area, such as house or shop property situated in a city, the description would run:—

Excavate the ground for cellars and basement to an average depth of (say) 9 ft., basket, and cart away, including grubbing up any old foundations or other obstacles on the site.

Boiler house, areas, &c.

(6)—Excavate the ground for boiler house, areas and other parts, to the extent shown on the plans, and deposit where directed within 20 yards run, (or cart away) but part return, fill in and ram.

Well (or cesspool).

(7)—Excavate for well (or cesspool), and deposit where directed within 20 yards run (or cart away), but part return, fill in and ram.

See Bricklayer, clause No. 111, and Drainage, clause No. 53, for the construction of wells; and Drainage, clause No. 50, for cesspools.

Very little, if any, of a well or cesspool excavation is returned and filled in, as they are invariably cut the exact size required.

Excavation for underpinning.

(8)—Excavate the ground required for the underpinning to the walls, and deposit where directed within 20 yards run (or cart away), including all shoring, needles and strutting. The excavation to be done in short lengths at a time of not more than 4 ft.

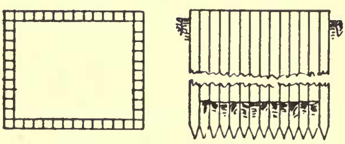
Excavation for foundations and concrete.

(9)—Excavate the ground to trenches, for footings, foundations, piers, and concrete, to the several depths and extents shown upon the plans, and deposit where directed within 20 yards run (or cart away), but part return, fill in and ram.

Ramming ground will not give a solid foundation, but the wall must be taken down until a solid foundation is found.

Quicksand excavation.

(10)—Pile round the area to be excavated, and excavate down to the solid gravel bed some (say) 10 ft. deep, and fill up the space with cement concrete to the level of the footings for the foundations. The sand may be used by the contractor, the value of which will be deducted at the architect's valuation. For a fuller description of piles, see Carpenter, clause No. 341, and if creosoted, see Carpenter, clause No. 26.



If there be a quicksand formation on the site, this will be found one of the best methods to overcome the difficulty, but give the area to be excavated with the depth. Piles, spaced at various distances apart, are also driven through a quicksand until they reach the solid bottom, then a concrete bed or layer is formed over them, upon which the building is erected (see Carpenter, clause No. 341), as the expense may be too great or perhaps it may be impossible to excavate some quicksands.

Garden walls and covered way. (**11**)—Excavate for front, return and other garden walls, piers and covered ways, and deposit where directed within 20 yards run (or cart away), but part return, fill in and ram.

See Bricklayer, clauses Nos. 98, 99 and 105 to 107, referring to garden walls, in which the excavation is taken in the general description, which perhaps is better.

Level. (**12**)—Well pun, consolidate and level the ground to the bottom of the trenches, excavations, and over the entire site of the building, so as to procure a level foundation for the walls, concrete and pavings.

See the note to clause No. 9.

Level lawn. (**13**)—Take up the turf to lawn in front garden, level, relay, roll down, and trim the borders, and sow with grass seeds and roll in.

Spring and Autumn are the best times for sowing grass seeds.

Level up old ground. (**14**)—Level over the ground where existing outbuildings are taken down, and fill up any excavations caused by their removal.

This clause may refer to any parts of the site not rebuilt upon, but from which existing buildings have been removed.

Plank, strut and stage. (**15**)—Perform as required all planking, strutting and staging to all excavations for trenches, piers, concrete, basements, cellars, areas and other parts.

Keep excavations free from water. (**16**)—Any water that may accumulate in the trenches or excavations during the progress of the work, either from rain, springs, floods or other causes, shall be baled or pumped out, or otherwise removed from the site, and the excavations be kept free.

Fill in and ram. (**17**)—Fill in, and ram the ground round the footings and walls.

or,

Fill in, and ram with hard dry brick rubbish round footings and walls, some 6 in. (to 9 in.) wide.

Brick rubbish under surface concrete. (**18**)—Lay over the whole site of buildings between the walls, hard dry brick rubbish 6 in. (or 9 in.) deep, level up and well ram to receive the concrete.

Do not fail to specify the surface excavations of sufficient depth to allow for the brick rubbish filling under the concrete.

Brick rubbish laid under surface concrete keeps the concrete dryer than if it is laid direct upon the ground, when the soil is damp; but with chalk, rock or gravel, brick rubbish is not required.

Fill up in brick rubbish. (**19**)—Fill up in hard dry brick rubbish, well ram and level up to receive the concrete to within 8 in. of the finished surface of the vestibule (or other parts).

In special places owing to the excavations it may require some considerable filling up, or owing to the finished level of those places being at a higher level than the general finished level.

Lime for concrete. (**20**)—The lime to be freshly burnt, ground grey chalk ("stone") lime from Dorking, Halling or Maidstone, and free from fatness.

or,

The lime to be freshly burnt, ground blue lias lime, from Barrow, Rugby or Whitby.

All these are hydraulic limes, though somewhat poor, but mostly in use in the London market, Barrow being about the best. Some blue lias limes are eminently hydraulic.

Hydraulic lime for concrete. (**21**)—The lime to be finely ground, specially powerful and carefully prepared, from Halkin Mountain or Aberthaw.

These are especially powerful hydraulic limes. The best lime concrete should be composed with a powerful hydraulic lime; and powerful hydraulic limes only should be used in wet situations.

Selenitic lime for concrete. (**22**)—To be selenitic blue lias lime.

This also may be used in wet situations for concrete, and is very strong.

Portland cement for concrete. (**23**)—The cement to be Portland cement from the banks of the Thames or Medway, finely ground, and weighing not less than 112 lbs. or more than 120 lbs. per imperial striked bushel, and when shaken through a sieve having 2500 meshes (perforations) to the square inch, shall not reject more than 15 per cent., and shall be capable of sustaining a tensile strain of 350 lbs. per square in. after seven days' immersion.

The cement to be laid out not more than 18 in. in depth, in a dry place, for some three weeks before using, and well turned over three times during that period.

Laying the cement out will cool it.

If a more stringent clause referring to Portland cement be required, the following description may be used:—

The briquettes to be made in moulds of brass or gun-metal, and laid upon a glass or metal bed.

The sectional area of the briquettes at point of fracture to be 1 in. square, and the average tensile strength of five briquettes to be taken. The five briquettes to be made all from the one gauging and placed in a tank of water twenty-four hours after gauging, remaining there for seven days, and tested immediately upon being taken out.

The cement to be gauged with 18 per cent. of clean water, and the weight applied for testing to be at the rate of 100 lbs. per 15 seconds. Fracture to take place at not less than 300 lbs. per square in.

Weight of cement to be not less than 112 lbs. or more than 120 lbs. per striked imperial bushel.

The cement, when shaken through a copper sieve having 2500 meshes to the square inch is not to reject more than 15 per cent. by weight.

The imperial bushel to be lightly filled, and the top taken off level.

Sand in concrete. **(24)**—The sand to be clean sharp Thames grit from above bridge, washed and screened, free from salt and other impurities.

or,

The sand to be clean sharp inland river grit, free from impurities, washed and screened.

or,

The sand to be clean sharp pit sand, washed and screened, and free from loam, peaty matter or other impurities.

Where dryness in concrete is essential, sea sand should not be used, and when a building is to be erected near the sea coast, a clause should clearly state this, otherwise the contractor may use sea sand in the work. This would equally apply to the sand for mortar or plaster. Also see notes to clause No. 8 in Bricklayer.

Ballast for concrete. **(25)**—The ballast to be Thames ballast, from above bridge (or inland river, or pit ballast), free from salt, loam and other impurities. That for the concrete foundations and surface concrete to pass a 2 in. ring, and for pavings and concrete flooring a $1\frac{1}{4}$ in. (or 1 in.) ring.

Ballast may also be of broken brick, burnt clay, flint, coke, chalk, earthenware, slag, gasworks breeze or other hard material, but sea shingle should never be used when dryness is essential. Ballast must not be of too smooth a material, and should be fairly porous. From 1 in. to $2\frac{1}{2}$ in. rings are employed for gauging the ballast.

Water. **(26)**—Provide clean, fresh river (or spring) water for the works, with all requisite storage tanks, cocks and temporary plumbing, and remove when directed. Sea water is not to be used.

Sea water will not harm concrete, in fact, it adds to its strength, but should only be used in such places where dryness is not essential.

Cement concrete for foundations.

(27)—Cement concrete to be composed of 5 parts ballast, 2 of sand and 1 of Portland cement, measured in boxes, mixed dry, turned over some three or four times, then water added, and turned over again until the whole is incorporated. If the interstices be not filled up, more sand and cement is to be added.

The proportions of ballast, sand and cement vary according to the nature of the concrete required. Here are a few of the proportions used:—

For concrete walling, 1 cement to 6, 7 or 8 ballast and sand. For roofs and floors, 1 cement to 5 or 6 ballast and sand (and a small proportion of gypsum where liable to be affected by heat). For concrete under water 1 cement to 4 or 6 of gravel and sand.

Lime concrete.

(28)—Lime concrete to be composed of 5 parts ballast, 1 sand and 1 blue lias lime (or other lime), measured in boxes, mixed dry, and water added after. If the interstices be not filled up, more sand and lime is to be added.

The proportions of ballast, sand and lime vary, and may be 5 parts ballast, 2 sand, 1 lime. State the kind of lime, if other than blue lias is required. See clause No. 20.

Special hydraulic lime concrete.

(29)—This description would be similar to the preceding clause, the lime being one of those mentioned in clause No. 21.

Selenitic lime concrete.

(30)—To be composed of 1 part selenitic lime to 6 parts ballast.

Method of mixing and laying concrete.

(31)—The specified proportions of ballast, sand and cement (or lime) are to be mixed on a clean stone or wood floor, after being carefully measured out in measures of approved dimensions, which are to be kept for this purpose on the works. The materials are to be turned over three times in a dry state, and then wetted through a coarse watering rose whilst being turned back the fourth time, and finally turned over once more and immediately deposited in the trenches, in layers not exceeding 12 in. in depth. Each layer to be well rammed, and the top surface swept clean and picked over and sprinkled with water before a further layer is deposited, each layer being allowed to set separately.

Concrete foundations.

(32)—Form cement (or lime) concrete foundations under all walls to the several depths shown, and projecting 4 in. (or 6 in.) on both sides beyond the lowest course of footings, the whole to be well rammed (or worked in with a spade) and levelled up for brickwork.

If the ground be hard gravel, chalk, rock, or similar compact substance, concrete is not absolutely necessary. Gravel, compact dry sand, chalk and rock make good foundations, as also clay, when free from water and the action of the weather.

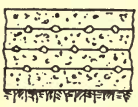
Concrete underpinning. (33)—The underpinning to the walls of the adjoining owners' premises to be carefully done in short lengths at a time, in hot Portland cement (or hot grey chalk lime) concrete.

Hot cement and hot lime are when they are imperfectly slaked or cooled, and consequently expand in the setting. See Bricklayer, clause No. 34, for brickwork in underpinning.

Boiler foundations. (34)—Lay cement concrete foundations under boiler (say) 2 ft. deep, and projecting 3 ft. on all sides beyond the area of boiler.

Heavy weights should have a solid foundation prepared for them. The depth of the concrete will vary from a few inches to very many feet, according to the nature of the foundation and the weight to be supported.

Concrete under very heavy weights.



(35)—Lay cement concrete foundations under large chimney shaft, in four layers, each layer being 12 in. thick. When one layer is nearly set hard, large rough ballast or stones from 4 in. to 8 in. diameter are to be thrown over the surface, and partly worked in so as to form a key for the next layer. Brush over each layer with a coarse broom, pick over, and well sprinkle with water before a next layer of concrete is formed.

Concrete is sometimes laid in this way in very heavy work. See notes to clause No. 34.

Concrete between arches. (36)—Fill in the spandrils between the arches with cement concrete.

Such as in an arched viaduct or other arched work.

Surface concrete. (37)—Lay over the whole site of the building between the walls, cement (or lime) concrete 6 in. (or 9 in.) thick, worked in with a shovel and levelled up.

There are other kinds of concrete, such as tar concrete, iron concrete and lead concrete, but these are only very occasionally used.

Ashes. (38)—Lay smith's ashes 2 in. (to 6 in.) thick over all concrete surfaces under boarded floors.

This keeps the growth of fungi away.

Clay puddle. (39)—The outside of all walls, tanks, cesspools and arches, or other brickwork in contact with the soil, is to be puddled round with well kneaded clay puddle 9 in. thick.

This will keep water from percolating through the brickwork. The puddle may be from 6 in. to 12 in. thick.

Fire-resisting Floors, Stairs and Roofs.

(Clauses Nos. 40 to 46.)

The newer term fire-resisting is perhaps more correct than the older term fireproof. It is more possible to make a building somewhat fire-resisting than absolutely fireproof.

Staging. (40)—Erect, case, and afterwards remove planking, staging and props (or centres) to concrete floors, walls and roofs. The planking to be kept $\frac{3}{4}$ in. below the steel (or iron) joists, and fitted close together. (See Carpenter, clause No. 34.)

See Carpenter, notes preceding clause No. 46, for weights on floors, and in addition allow for the weight of the steel or iron joists, the concrete or brick filling, and the paving or flooring above.

Purbeck paving . .	$2\frac{1}{2}$ in.	thick weighs about	34 lbs.	per ft. super.
Granite „ . . .	3 in.	„ „	42 lbs.	„ „
Artificial stone paving	2 in.	„ „	$25\frac{1}{2}$ lbs.	„ „
York „ „	2 in.	„ „	26 lbs.	„ „
York „ „	$2\frac{1}{2}$ in.	„ „	$32\frac{1}{2}$ lbs.	„ „
York „ „	3 in.	„ „	39 lbs.	„ „

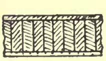
Asphalt paving . .	1 in.	thick weighs about	$12\frac{1}{2}$ lbs.	per ft. super.
Cement and sand paving	1 in.	„ „	10 lbs.	„ „
Wood block (fir) „	2 in.	„ „	$6\frac{1}{2}$ lbs.	„ „

Cement concrete weighs from about 137 to 142 lbs. per cubic ft.
Lime concrete weighs about . . . . 120 lbs. „
Ordinary brickwork in mortar weighs about . 110 lbs. „
Ordinary brickwork in cement weighs about. 112 lbs. „
Coke breeze and cement 6 in. thick, with steel or iron joists, weigh about 70 lbs. per ft. super.

One ton of York paving $2\frac{1}{2}$ in. thick will cover about 70 super. feet.
„ „ „ 3 in. „ „ 58 „ „

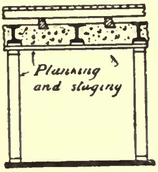
Brick, plaster and wrought iron resist fire, as also concrete when mixed with cement and breeze (or gypsum), but stone and cast iron do not.

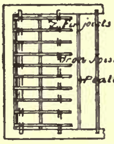
There are various ways of constructing fire-resisting floors, those most commonly in use being formed with concrete placed between steel or iron joists, supported while it sets with staging from below. Also brick arches with brick springers supported on centres while setting, may be turned between the steel (or iron) joists, with a tension rod taken through the joists and arches every now and then to take the thrust of the last arches, and the spandrils filled in with concrete. The arches may be from 4 ft. to 12 ft. spans, with a least rise of one-tenth the span for mills, and one-eighth for warehouses. There are several patents for fire-resisting floors. Timber joists placed close together and plastered beneath, make a fire-resisting floor.

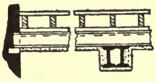


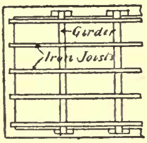
Concrete fire-resisting floors with deal flooring over.

(**41**)—Form all floors, landings and passages upon staging, with cement concrete 6 in. thick (or other depth), composed of 1 part Portland cement, 5 (or 4) parts ballast to pass a 1 in. (or $1\frac{1}{4}$ in.) diameter ring, 1 part sand, and 1 part coke breeze (slag or gypsum), mixed together dry and water added after, and well worked in between the steel (or iron) joists with a shovel. When the staging is removed, fill in the under side of joists with fine concrete (or cement). The joists to be spaced 2 ft. 6 in. apart. (Then give the sizes of the joists, which would vary according to the span, see Smith, clause No. 15. If the span be considerable, heavier cross joists or girders may be required to support the joists carrying the concrete, these may be cased round with cement.) The fir joists carrying the flooring to be $4\frac{1}{2}$ in. (or 5 in.) $\times 2\frac{1}{2}$ in., spiked to 4 in. $\times$ 4 in. splayed fir plates bedded 2 in. down in the concrete. A 7 in. $\times$ 4 in. deal is to cut into two plates.



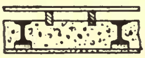






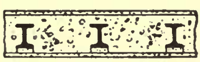
or,

The fir joists to be $4\frac{1}{2}$ in. (or 5 in.) $\times 2\frac{1}{2}$ in., bedded in the concrete $1\frac{1}{2}$ in. (or 2 in.) down (either parallel with, or crossing the steel or iron joists, but without plates).

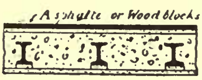


Concrete 5 in. thick will carry ordinary loads of private houses up to about 4 ft. span. The steel or iron joists are usually placed from 2 ft. 6 in. to 3 ft. apart. The under side of the concrete floor may be rendered over in gauged plaster or cement, see Plasterer, clauses Nos. 27 and 51.

If the concrete floor is to be paved over in cement or asphalt or with wood blocks, then the concrete should be some 3 in. thicker than the full depth of the joists, this will allow the concrete to be $\frac{3}{4}$ in. below the joists and $2\frac{1}{4}$ in. above, thus forming a key for the rendering beneath and the paving above.



If asphalt or wood block paving be required, the concrete must be first rendered over $\frac{3}{4}$ in. (or 1 in.) thick, so as to form a smooth surface upon which to lay the asphalt or wood blocks.

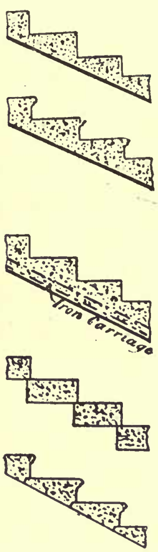


If stone paving be required, then the concrete need only be about 1 in. above the joists, the stone paving being laid in mortar and grouted in cement.

See Pavior, clauses Nos. 2, 4, 7 and 8, and Mason, clauses Nos. 42 to 44, 65, 66, 76 and 77, for various kinds of paving; and Carpenter, clauses Nos. 58 to 71, for flooring. See Pavior, clause No. 3, for concrete floors laid to existing timber floors. When a wooden staircase has concrete landings, a wooden nosing must be described as a finish, similar to ordinary wooden staircases, but screwed down into plugs let in the concrete.

Concrete fire-resisting stairs.

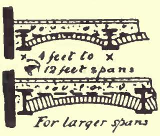
(**42**)—The staircases from ground to second floor, together with the quarter and half space landings, to be



formed in situ, upon wrought timber frames and props, with concrete composed of 1 part Portland cement, 1 part fine shingle (or granite chippings) passing a $\frac{3}{4}$ in. ring, and 1 part coke breeze (slag or gypsum). The surfaces to be worked up smooth with a trowel, the arrises taken off $\frac{1}{4}$ in., and holes formed for balusters. Form the steps with 11 in. treads, $6\frac{1}{2}$ in. rise, 6 in. into walls, and 3 ft. 6 in. projection. Render and set the soffits in cement. (See Plasterer, clauses Nos. 27 and 51.)

The steps may be built with iron carriages, see Smith, clause No. 13; Carpenter, notes to clause No. 221; and Mason, notes to clause No. 64. When the steps are more than 4 ft. wide, they should be provided with two (or more) iron carriages. Describe the balusters and handrail, as in Mason, clause No. 64. Concrete steps may be cast in blocks and fixed like ordinary stone steps, as in Mason, clauses Nos. 64, 67 to 75 and 78 to 80. State if molded nosings are to be worked or cast on the treads with mitred and returned nosings at outer ends.

Arched fire-resisting floors.



(43)—Form on centres all floors, landings and passages with brick arches in cement half a brick thick, with brick springing pieces against joists, and fill in above with cement concrete. Take $\frac{3}{4}$ in. (or 1 in.) diameter tie rods through all the joists every 6 ft. (to 10 ft.) apart, with nuts, beads and large washers.

Half-brick arches will do up to 4 ft. spans, and one-brick arches up to 21 ft. spans.

Then describe the steel or iron joists, fir joists, the paving or flooring, see clause No. 41, with notes. The under side of arches may be rendered over in cement, or pointed. Sometimes the arches are in enamelled bricks.

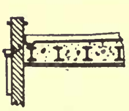
The objection to arches in a fire-resisting floor is that if one arch fails the others are likely to give way.

Tile fire-resisting floor.

(44)—Form the floor on centres with flat tiles as arches, the lowermost course to be laid dry on the centering, and then flushed up in cement, and the three other courses laid in cement. Fill in above with cement concrete. Take $\frac{3}{4}$ in. diameter tie rods through all the joists every 6 ft. apart, with nuts, heads and large washers.

Then describe the steel or iron joists, fir joists, the paving or flooring, see Clause No. 41, with notes. The under side of arches may be rendered over in cement. This form of floor is very suitable for the tops of hot closets and drying horse chambers in laundries. It may be fixed up to 6 ft. spans.

Concrete flats rendered in cement.

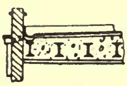


(45)—The steel or iron joists, arches and concrete would be the same as to floors, see clauses Nos. 40, 41 and 43, but state that the concrete is to be formed up to a fall of 2 in. in 10 ft., with a gutter and outlet formed on one side. Render over in cement $1\frac{1}{4}$ in. thick, finished a trowelled face in neat cement $\frac{3}{8}$ in. thick in the one operation, and with angle fillets against walls.

It is somewhat difficult to keep out the wet from a cement paved concrete flat when subject to the weather. It is better to cover the flat over with asphalt, when the description would run as clause No. 46. The weights to be considered in a concrete roof are the steel or iron joists, the concrete, the paving on top, as well as wind and snow, and any weight likely to be put upon it; see notes to clause No. 40, and notes preceding clause No. 74 in Carpenter.

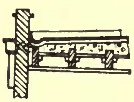
With concrete floors or roofs to outside terraces, gangways and other similar positions, which may be paved with a pervious material, such as stone chippings, gravel, or loose tar paving, then the concrete should be asphalted over $\frac{1}{2}$ in. (or $\frac{3}{4}$ in.) thick, to keep the wet from percolating below, or the surface may be spread over with a composition of pitch and tar about $\frac{1}{2}$ in. thick.

Concrete flats covered with asphalt.

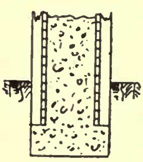


(**46**)—Cover the roof flat with $\frac{3}{4}$ in. (or 1 in.) mastic asphalt, laid to falls in two thicknesses in 3 ft. widths breaking joint, with 6 in. $\times \frac{5}{8}$ in. (or $\frac{3}{4}$ in.) asphalt skirting, and angle fillet against the walls, and with gutter and outlet on one side. Form the concrete under (say) 9 in. thick, render up level 1 in. thick in cement, and allow to dry before the asphalt is applied. Describe the steel or iron joists, see clause No. 41.

Outside corridors and terraces would be formed in the same way. See Pavior, notes under clause No. 7, for asphalts. The pitch to asphalt flats may be 2 in. in 10 ft., but not more than one-tenth the span where there is much sun. Concrete and asphalt flats may be formed to existing timber flats, if the joists be strong enough, by spiking the joists with $2\frac{1}{2}$ in. $\times$ 2 in. deal fillets, and then laying 1 in. rough boarding between, and filling in over with concrete, cement and asphalt, in the same way as described in the above clause, but this class of roof will not be fire-resisting.



Concrete walls to buildings.



(**47**)—The walls to be built with concrete, composed of 1 part Portland cement, 1 part sand, and 6 parts ballast to pass a $1\frac{1}{2}$ in. diameter ring.

Form the concrete walls between strong timber framing, and rough boarding wrought on the side where against the external face of walls. The concrete to be laid in parallel courses, not more than 15 in. deep at a time, the upper surface being left rough to form a key for each successive layer. Remove timber work when directed. (Give the thickness of the walls to the several floors.)

See Carpenter, clause No. 34, for the timber work.

A 12 in. concrete wall is equal in strength to a $1\frac{1}{2}$ brick wall, therefore, taking the various thicknesses of brick walls mentioned under clause No. 17 in Bricklayer, the sizes of the walls, if in concrete, may be calculated accordingly, but a partition concrete wall should not be less than 6 in. thick. In the County of London, concrete walls have to be about the same thicknesses as those given for walls under clause

No. 17 in Bricklayer. If the external surface of the walls be rendered over in cement, which is necessary for a neat finish, the timber boarding will not require to be wrought on the one side. For the cement rendering, the window dressings, sills and cornices, see Plasterer, clauses Nos. 68 to 71 and 73.

The London Building Act, 1894, requires that concrete walls to buildings situate in the County of London area, should be composed of 1 part Portland cement, 2 parts sand, and 3 parts ballast to pass a 2 in. diameter ring.

Concrete walls communicate sound. Flues in concrete walls should be lined with stoneware flue pipes.

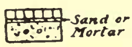
Concrete river walling.

(48)—See Bricklayer, clause No. 110.

PAVIOR.

Cuttings. (**1**)—Paving tiles to be neatly cut to the irregular angles and curves, immersed in water, jointed, and bedded in neat cement $\frac{1}{4}$ in. (to $\frac{3}{8}$ in.) thick, and when set, washed over in cold water and soft soap, and wiped off dry with a cloth several times during the first few weeks after laying.

Stains can be removed from tiles by using muriatic acid diluted with water, applied with pumice-stone and wiped off with a cloth.



Outhouses, sheds, cellars and similar positions may be paved with hard grey stocks, malm paviors, or Staffordshire blue bricks, either laid flat or on edge, in straight courses or herring-bone, in sand or mortar, on 4 in. (or 6 in.) lime (or cement) concrete, or laid dry and grouted in cement (or lime) mortar. The sand or mortar bedding enables the bricks to be worked in level. These bricks measure about $8\frac{3}{4}$ in. $\times$ $4\frac{1}{4}$ in. $\times$ $2\frac{3}{4}$ in.

Outside lobbies and best inside passages may be paved with Suffolk whites (about $8\frac{3}{4}$ in. $\times$ $4\frac{1}{4}$ in. $\times$ $2\frac{3}{4}$ in.) in any of the ways just mentioned, but in these positions they are seldom bedded on sand.

Sculleries, larders, passages and such like positions may be paved with blue Staffordshire or Broseley paving bricks (9 in. $\times$ $4\frac{1}{2}$ in. $\times$ 2 in.), laid in cement on concrete bed. Blue Staffordshire chequered bricks (9 in. $\times$ $4\frac{1}{2}$ in. $\times$ 2 in. and 12 in. $\times$ 6 in. $\times$ $2\frac{1}{2}$ in.) laid in cement on concrete bed, may be used in yards.

Dutch clinker blue paving bricks ($6\frac{1}{4}$ in. $\times$ 3 in. $\times$ $1\frac{1}{2}$ in.), blue Staffordshire stable bricks (9 in. $\times$ $4\frac{1}{2}$ in. $\times$ $2\frac{1}{2}$ in.), either plain or chamfered, and Adamantine clinker paving bricks (6 in. $\times$ $2\frac{1}{2}$ in. $\times$ $1\frac{3}{4}$ in.) (yellow in tint), either plain or chamfered, are all used for stables and pavings.

Staffordshire blue or red paving tiles (6 in. $\times$ 6 in. $\times$ 1 in., 9 in. $\times$ 9 in. $\times$ 1 in., 10 in. $\times$ 10 in. $\times$ 1 in. and 12 in. $\times$ 12 in. $\times$ $1\frac{1}{2}$ in.) are made in squares, hexagons and octagons, and when used for floor pavings are called "quarries." They are generally found in old buildings.

Broseley red or Staffordshire blue (10 in. $\times$ 5 in. $\times$ 1 in.) wire cut paving bricks are suitable for passages and larders.

Encaustic tiles are made in various colours in 6 in. $\times$ 6 in., $4\frac{1}{4}$ in. $\times$ $4\frac{1}{4}$ in., 4 in. $\times$ 4 in., 3 in. $\times$ 3 in. and $2\frac{1}{8}$ in. $\times$ $2\frac{1}{8}$ in. squares and other shapes, and mostly used for paving halls and passages, and are sometimes used on walls. They may also be had in other sizes.

Majolica tiles are made in various colours with a glazed surface, either plain or raised, and are only suitable for vertical positions, they are made in the same sizes as encaustic tiles.

Tesseræ are very small encaustic tiles in various colours, and used for pavings to halls and passages. The word is also applied to small marble cubes.

In all tile paving a very level surface is required, and the concrete must be floated over $\frac{3}{4}$ in. (to 1 in.) thick to an even face, and the tiles be jointed and bedded in cement about $\frac{1}{4}$ in. to $\frac{3}{8}$ in. thick (so as to work them in evenly), and when set, washed perfectly clean in cold water and soft soap, and wiped dry several times for the first few weeks. This will much improve the colour.

In external pavings, in stables, wash-houses and similar places, they must be laid to falls.

Vestibule mat space and mat.

(2)—Pave vestibule with polished Roman (or Venetian) marble mosaic filling and border in cement, of the p.c. sum, (say) £8, laid upon a $\frac{3}{4}$ in. (or 1 in.) cement mortar floated face, form a 3 ft. × 2 ft. 6 in. sinking for mat 2 in. deep, with a 4 in. × 3 in. × $\frac{1}{4}$ in. L iron frame, and provide a door mat, (say) p.c. 15s. (An L iron should also be put where tiles or mosaic butt against a boarded floor.)

For concrete, see Excavator, clause No. 37.

The frame for mat may be of rubbed slate (say)  3 in. × 2 in. or  in a $\frac{1}{4}$ in. thick flat iron rim from 2 in. to 4 in. deep. Also see Carpenter, clause No. 64.

Marble mosaic pavements are formed with small pieces of coloured marble cubes, from $\frac{1}{8}$ in. to 1 in. square, and $\frac{1}{2}$ in. to 1 in. thick, in various shapes. They are generally set out to the required designs on prepared paper, and laid in position in sections, and then rubbed down, polished and oiled in.

Granito is also formed of coloured marbles in very small pieces, and thrown in without regard to design, then rubbed down, polished and oiled in.

Mosaic and granito are largely used for corridors, passages and pavements.

or,

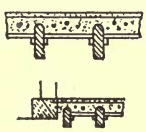
Pave the vestibule, hall, and ground floor passages with encaustic tile paving and border, (say) p.c. 15s. per square yard, laid in cement on a $\frac{3}{4}$ in. (or 1 in.) cement mortar floated face.

For concrete, see Excavator, clause No. 37.

Ceramic pavement consists of small tiles in various colours, and of similar sizes to marble mosaic. It is laid in the same way, but does not require rubbing down or polishing, as the tiles are too hard.

See notes under clause No. 1 for other kinds of paving.

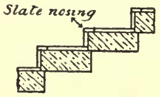
Tile or mosaic paving to an existing boarded floor.



(3)—Take up boarding, adze off the edges of timbers, and fillet the joists half way down with 2 in. × 1 in. fillets (or angle fillets out of 2 in. × 2 in.), lay $\frac{3}{4}$ in. rough boarding between joists, and fill in with fine cement concrete, finished in cement mortar $\frac{3}{4}$ in. (or 1 in.) thick, and lay in cement tile paving, (say) p.c. 10s. per square yard, level with the existing floor. The front step to be rebated out to receive the tiling.

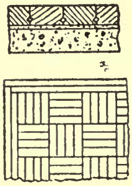
If the joists be sufficiently strong, they may be reduced in depth to give a better key for the work. Marble mosaic, granito and ceramic pavements may be laid in the same way.

If existing steps have to be covered with tiles, an 1 in. (or $1\frac{1}{4}$ in.) slate nosing about $2\frac{1}{2}$ in. (or 3 in.) wide will be required to each step, screwed down with brass or gun-metal screws every 12 in. apart.



For marble-lined steps see Mason, clause No. 128.

Kitchen and basement floors and passages.



(**4**)—Lay these floors with 12 in. × 3 in. × $1\frac{3}{4}$ in. cut and grooved, solid, wrought all-round deal wood block flooring, in squares (or herring-bone), with margins round all rooms and passages two (or one) blocks wide, on a $\frac{3}{4}$ in. (or 1 in.) cement mortar floated face. The blocks to be dipped half-way up in hot liquid tar and pitch composition in the proportion of 2 to 1 when being laid, and when set, traversed and smoothed over. (If the blocks are too thin or too long they are liable to work up.)

For concrete, see Excavator, clause No. 37.

Asphalt may also be laid on the cement face about $\frac{1}{4}$ in. to $\frac{3}{8}$ in. thick, as a precaution against damp. These floors should more properly be described under Carpenter, see Carpenter, clauses Nos. 68 and 69. Wood block flooring may also be 1 in., $1\frac{1}{4}$ in., $1\frac{1}{2}$ in., 2 in. and $2\frac{1}{2}$ in. thick, according to the traffic, and in blocks up to 18 in. long, and in any kind of wood, such as oak, teak or pitch pine. There are various patents for this class of flooring.

Cement hearths.

(**5**)—The front and back hearths to basement and attic floors to be worked up with a steel trowel in cement 1 in. thick, in the proportion of 1 part of Portland cement to 1 of sand, and finished in $\frac{3}{8}$ in. neat cement.

Also see Bricklayer, clause No. 42.

Red Broseley wire-cut paving bricks (10 in. × 5 in. × 1 in.) are also suitable for hearths in these positions.

Tile hearths and kerbs.

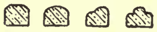
(**6**)—Allow the p.c. sum of £1 for each of the ground floor tile hearths; and the p.c. sum of 15s. for each of the first floor tile hearths, and lay in neat cement on a $\frac{3}{4}$ in. thick cement floated bed.

Tile hearths may be either plain, glazed, or painted, according to position. Polished marble $\frac{3}{4}$ in. to $1\frac{1}{2}$ in. thick is also used for hearths in Sicilian, vein or black marble, see Mason, clause No. 122.

Hearth kerbs.

Allow the p.c. sum of £2 for each of the ground floor marble hearth kerbs, and £1. 10s. for each of the first floor marble hearth kerbs. The kerbs to be set in cement 1 in. below floor level, dowelled at angles and to chimney-pieces. (See Mason, clause No. 123.)

Kerbs may also be in stone, enamelled slate, or glazed brick ware, and in many sections, the round section is the best, as it shows damage the least.



Scullery, larder, pantry, wash-house and passages.

(7)—Pave scullery, larder, pantry, wash-house and passages adjoining, with cement paving $1\frac{1}{4}$ in. (or $1\frac{1}{2}$ in.) thick, in the proportion of 1 Portland cement to 1 sand, and when nearly set, float over with a steel float in neat Portland cement $\frac{3}{8}$ in. thick, and before finally set, water is to be flooded over about 2 in. deep.

For concrete, see Excavator, clause No. 37.
Cement paving hardens better under water.

or,

Pave the scullery, larder, pantry, wash-house and passages with 6 in. × 6 in. × 1 in. black and red Staffordshire quarries in cement, laid diagonally on a $\frac{3}{4}$ in. (or 1 in.) cement floated face.

For concrete, see Excavator, clause No. 37.
See notes under clause No. 1 for other kinds of suitable paving.

or,

Pave the scullery and wash-house with mastic asphalt $\frac{3}{4}$ in. (or 1 in.) thick, laid in 3 ft. widths at a time, and rubbed to a true surface, with a 6 in. × $\frac{5}{8}$ (or $\frac{3}{4}$) in. asphalt skirting jointed to the paving with an asphalt angle fillet, the whole being laid on a 6 in. cement (or lime) concrete foundation floated up level in fine stuff $\frac{3}{4}$ in. thick, and allowed to dry before the asphalt is applied.

See Excavator, notes to clause No. 41, for asphalt paving to fire-resisting floors. Mastic asphalt as paving up to 1 in. thick should be laid in one thickness, if over 1 in. then in two thicknesses, but if it is to be waterproof then in two thicknesses up to 1 in. thick.

State if any channels are to be formed to take off the water, or if the paving is to be laid to falls.

Asphalt used in ordinary flooring may be laid $\frac{1}{2}$ in., $\frac{3}{4}$ in. and 1 in. thick. Where subject to heavy wear, it may be 1 in. to $1\frac{1}{4}$ in. thick. As a road paving and on footpaths, $1\frac{1}{2}$ in. to 2 in. and 1 in. to $1\frac{1}{4}$ in. thick respectively, see "Road-making," clauses Nos. 33 and 34. Where laid as a waterproof covering to arches, $\frac{1}{2}$ in. to $\frac{3}{4}$ in. is sufficient, see Bricklayer, clause No. 43. As a damp-proof course to horizontal walls, $\frac{3}{8}$ in., $\frac{1}{2}$ in. and $\frac{3}{4}$ in. thick, see Bricklayer, clause No. 62. As a damp-proof course to vertical walls, $\frac{5}{8}$ in. or $\frac{3}{4}$ in. thick, see Bricklayer, notes to clause No. 1. As a roof covering, and to outside terraces and corridors, it may be $\frac{3}{4}$ in. to 1 in. thick, see Excavator, clause No. 46.

Mastic asphalt is generally made in three qualities: "Fine," being suitable for magazine paving; "Fine gritted," for flats, arches and lining tanks; "Coarse gritted," as flooring, and as a paving to courts, roads, pavements and other places subject to great wear.

Asphalt is both fire and water-proof. It may be laid either in a mastic state; or as powder compressed with hot iron rammers. The mastic state is suitable for walls, arches, floors, roofs, and linings to tanks. The powdered state is suitable for floors, roads, pavements, horizontal surfaces, and such positions only when subject to much traffic, otherwise it will not keep down.

Asphalt must always be laid on a dry bed. There are various manufactures of asphalt.

Cellars. (8)—Pave the boiler-house, the coal, wood and other cellars, with $1\frac{1}{4}$ in. (or $1\frac{1}{2}$ in.) cement paving, in the proportion of 1 Portland cement to 1 of sand, finished with a steel float in one operation.

In rough situations the work is not required to be so finely finished. For concrete, see Excavator, clause No. 37.

or,

Pave the boiler-house, the coal, wood and other cellars, with hard stock paving bricks laid on edge, in lime (or cement) mortar, upon a sand bedding spread over the concrete.

For concrete, see Excavator, clause No. 37.
See notes under clause No. 1 for other kinds of paving.

Yard and areas. (9)—Excavate ground to an average depth of 18 in., (more or less) and cart away (or wheel and deposit a stated distance). Fill in with 9 in. brick rubbish well rammed, and a 4 in. (or 6 in.) cement concrete bed on top, and pave the yard and areas with cement concrete paving 2 in. thick, laid to falls of 2 in. in 10 ft., floated with a steel float and worked to a smooth surface. The concrete paving to be composed of 1 part Portland cement to 4 parts of shingle the size of horse beans, and fined up on top in neat cement $\frac{3}{8}$ in. thick in the one operation.

It is always well in cement paving to finish it in the one operation, especially when it is outside, otherwise it is sure to work up. The excavation, brick rubbish and rough concrete bed may be described in Excavator. State if any channels are to be formed. Crushed granite and Portland cement make a capital pavement, see "Road-making," clause No. 16.

or,

Pave the yard with blue Staffordshire bricks, laid in cement to falls on a $\frac{3}{4}$ in. cement floated face (or on a sand bed).

For concrete, see Excavator, clause No. 37.
See notes under clause No. 1 for other kinds of paving.

York paving. See Mason, clauses Nos. 41 to 45; and under "Road-making," clause No. 6.

Artificial stone paving. See under "Road-making," clause No. 7.

Marble paving. See Mason, clause No. 118.

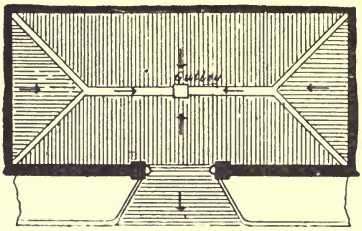
Pavings to street paths. See under "Road-making," clauses Nos. 6 to 17, 30, 31, and 34.

Entrance to carriage gates. **(10)**—See clause No. 11, referring to the paving of entrances to stable yards.

Paving to Stable Buildings.

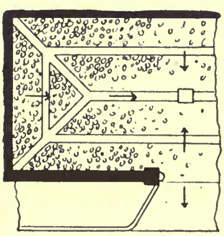
(Clauses Nos. 11 to 13.)

Stable yard. **(11)**—Pave the stable yard with 3 in. × 7 in. × 10 in. Aberdeen granite setts, in parallel courses touching one another, laid to falls of $\frac{3}{8}$ in. to the foot, on a sand (or fine shingle) bed 1 in. (to $1\frac{1}{2}$ in.) thick, with a foundation of 6 in. cement concrete under. Grout in cement mortar, well ram, and top dress with sand (or fine shingle). Each of the setts to be fairly well dressed and squared. Form the mitres in two courses wide, and the channels in three courses wide, with falls to gully. Pave the entrance from roadway with setts on concrete in a similar way, with 12 in. × 6 in. Aberdeen granite kerbing and corners to each side, laid flat (or on edge) in lengths of not less than 3 ft., with the top and front surfaces finely dressed (axed or drafted), and the back edge and ends squared and dressed (or drafted) 1 in. down, and jointed in cement. The kerb corners to be worked to a circular sweep 18 in. external radius (or other sweep).



For paving setts, see "Road-making," clause No. 30.
For granite kerb, see "Road-making," clause No. 4.

Rowley Hall, 3 in. × 6 in. × 9 in. paving setts are very suitable for stable yards, as also Kentish Rag paving setts. With great care, a carriage and pair can turn round in a space of 16 ft. square, but 20 ft. square is a more useful area of space.



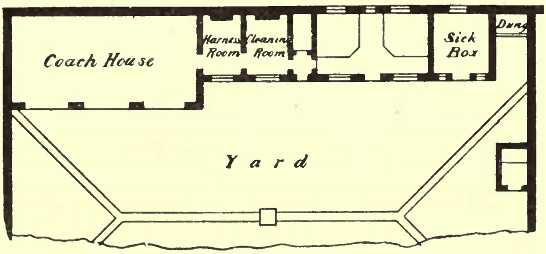
A large one-horse van will require 20 ft. square to turn round in.

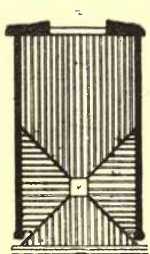
Aberdeen or Guernsey granite setts in 4 in. cubes may be used for stable yards.

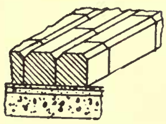
In some parts, flint boulders are used as paving to yards, with brick bands to bind them together, they require a very great fall to keep tolerably clean.

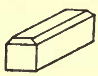
Paving inside stables.

(**12**)—Stables may be paved in two ways, according as to whether there be surface or underground drains.









There is not much objection to underground drains in a stable, if a straight run can be obtained, with access at both ends. The description of the paving in this latter case would run:—

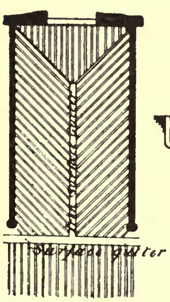
Pave the loose boxes, sick box, stall and cleaning-room, with 6 in. $\times$ $2\frac{1}{2}$ in. $\times$ $1\frac{3}{4}$ in. yellow-tinted Adamantine clinkers, chamfered on two edges only, laid in $\frac{3}{8}$ in. neat cement to falls to horse-pots of $1\frac{1}{4}$ in. in 6 ft., on a $\frac{3}{4}$ in. floated bed, composed of 1 part Portland cement to 1 part sand, with a 6 in. cement concrete foundation under. Grout over in neat cement well brushed in, and clean off. (Or the cement may be thrown on dry, brushed in, flooded over with water and cleaned off.)

The passage to be formed with similar clinkers chamfered on four edges, and laid level in herring-bone fashion, with a border of two (or three) lines of bricks round.

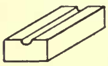
The usual size of loose boxes is 12 ft. $\times$ 12 ft., sometimes they are made 10 ft. $\times$ 8 ft., 10 ft. $\times$ 12 ft., and 12 ft. $\times$ 14 ft. The usual size of stalls is 9 ft. $\times$ 6 ft., they may be made 9 ft. 6 in. $\times$ 6 ft. and 10 ft. $\times$ 6 ft. The passage in front should not be less than 6 ft., but 7 ft. is a very good width, and no stable should be less than 16 ft. to 18 ft. wide in all. The height of a stable should not be less than 10 ft. or more than 12 ft.

The fall of the paving in the stalls and loose boxes should only be just sufficient for the urine to run off, as it is harmful to horses to stand much out of the level.

If there be no underground drains, but iron surface gutters be used, then the description of the paving would remain exactly the same, except it would be described as laid to falls to the iron surface gutters, instead of to the horse-pots. By using clinkers chamfered on two edges only, for stalls and loose boxes, it allows the urine to run freely to the horse-pots or iron surface drains, without being impeded by any cross chamfers. In a passage, the clinkers are chamfered on four edges merely for appearance, there being no urine passing over it. But it will assist the cleansing of a passage if it be laid to a slight fall to some point.



Unchamfered 6 in. × $2\frac{1}{2}$ in. × $1\frac{3}{4}$ in. yellow-tinted Adamantine clinkers, and Dutch blue clinkers $6\frac{1}{4}$ in. × 3 in. × $1\frac{1}{2}$ in., are also used for stalls, loose boxes and passages, but they afford no foothold for the horses. They may be used in coach-houses and like positions if desired.



An 8 in. × $2\frac{5}{8}$ in. × $2\frac{5}{8}$ in. grooved brick is very suitable for stable paving in all positions.

Stable paving may be made of granite or slag concrete, laid in situ in the one operation, either with or without grooves, but without joints.

The harness room may be paved with wood block flooring, as clause No. 4.

Coach-house.

(13)—A coach-house may be paved with cement laid to a fall of 2 in. in 10 ft. on a bed of concrete, similar to clauses No. 7 or 9.

or,

in plain unchamfered Adamantine clinkers, as in notes to clause No. 12; on concrete, as in clause No. 37 in Excavator.

or,

in Dutch blue clinkers, as in notes to clause No. 12; on concrete, as clause No. 37 in Excavator.

or,

in blue Staffordshire paving bricks, 9 in. × $4\frac{1}{2}$ in. × 2 in. (or 12 in. × 6 in. × 2 in.); on concrete, as clause No. 37 in Excavator.

or,

in hard paviors, 9 in. × $4\frac{1}{2}$ in. × 3 in., either flat or on edge on concrete, see clause No. 8.

The following particulars referring to the areas which various carriages occupy, will be found useful in settling the size of a coach-house. The distance which carriages should be placed apart in a coach-house, in order that there may be room to get round, is from 15 in. to 18 in. or 20 in.

Large Landau, 12 ft. 4 in. long, 5 ft. 7 in. wide, 6 ft. 9 in. high, and with shafts turned up 9 ft. 5 in. high.

Brougham, 11 ft. 3 in. long, 5 ft. 6 in. wide, 6 ft. 1 in. high, and with shafts turned up 9 ft. 5 in. high.

Victoria, 11 ft. long, 5 ft. 6 in. wide, 6 ft. 5 in. high, and with shafts turned up 9 ft. 5 in. high.

A four-wheel dog-cart, 7 ft. 9 in. to 8 ft. long, 5 ft. to 5 ft. 3 in. wide, 5 ft. 9 in. to 6 ft. high, and with shafts turned up about 9 ft. 5 in. high.

A two-wheel dog-cart, 11 ft. 8 in. to 12 ft. long, 5 ft. 4 in. to 5 ft. 6 in. wide, 5 ft. 11 in. to 6 ft. 2 in. high, the shafts being fixed.

A four-wheel pony carriage, 9 ft. 8 in. long, 4 ft. 6 in. wide, 5 ft. 11 in. high, and with shafts turned up about 7 ft. 6 in. high.

A four-wheel Bath chair for a pony, 7 ft. 9 in. long, 3 ft. 6 in. wide, 6 ft. 2 in. high, and with shafts turned up about 7 ft. 3 in. high.

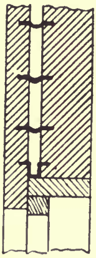
The shafts to all kinds of carriages may either be turned up or taken off, except in the case of a two-wheel dog-cart, when they are generally fixed. The various lengths given for the carriages are with the shafts taken off.

Coaches, business vans and carts are made in many sizes.

BRICKLAYER.

For concrete walls to buildings, see Excavator, clause No. 47.
For concrete river or sea walling, see clause No. 110.
For the thicknesses of hollow walls, see notes to clause No. 17.
It is preferable to build all external brick walls hollow; but if solid brick walls are required, then the following clause, No. 1, would be omitted.

Hollow walls.

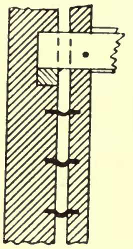


(1)—All external walls to be built hollow, with a $2\frac{1}{4}$ in. (or $2\frac{1}{2}$ in.) cavity between the outer and inner casings, and tied together with heavy galvanised wrought (or cast) iron wall-ties about $8\frac{1}{2}$ in. $\times$ $2\frac{1}{4}$ in. $\times$ $\frac{3}{8}$ in.  shape, spaced 3 ft. apart alternately to every third course of brickwork. The mortar droppings to be carefully gathered up on wood laths (or lead pipe covered with hay bands) placed in the cavity. Immediately under the eaves course there are to be placed 9 in. $\times$ 3 in. (or 9 in. $\times$ 6 in.) perforated air-bricks (or galvanised iron gratings) every 10 ft. apart, and similar air-bricks at the base of the walls for ventilating the cavities.

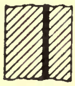
The lintels over door and window frames, where fixed in hollow walls, are to be protected with 4 lb. lead coverings, built into the inner and outer casings to form a gutter, and projecting beyond the lintels on either side 4 in., and turned down to throw off any accumulating water.

If the lintels should not run through the cavity, then this lead covering would equally be required over the door and window heads. Hollow walls prevent heat, cold and wet penetrating into the interior of a building. They are most essential in wet aspects and near the sea, but in these situations, walls, instead of being hollow, are sometimes battened out on the inner side with 2 in. $\times$ $\frac{3}{4}$ in. fir battens every 12 in. apart, to which the lathing and plastering is attached. In hollow walls it is better to make the outer casing the lesser thickness, so that the inner casing may be of sufficient strength and thickness for bedding the joists and roof timbers upon. Thus a 9 in. wall would have both the outer and inner casings $\frac{1}{2}$ brick thick. In a 14 in. wall there would be a $\frac{1}{2}$ brick outer, and a 1 brick inner casing. In an 18 in. wall, perhaps the outer and inner casings might each be 1 brick thick. The last two or three courses of brickwork at the top, immediately under the eaves or parapets, are sometimes built solid right through for strength, if this be required, then state it.

In a fairly solid hollow stone wall the outer casing has necessarily to be thick, as stonework should not be worked to so small a thickness as brickwork; a $\frac{1}{2}$ brick wall may be used as the inner casing, with a similar $2\frac{1}{4}$ in. (or $2\frac{1}{2}$ in.) cavity, and ventilating gratings as before. The joists and roof timber must go through the cavity and be built round and bear on the solid outer stone wall, unless the inner casing be made sufficiently strong to take them.



Wall-ties or cramps are also made in wrought iron, about 8 in. $\times$ 1 in. $\times \frac{1}{8}$ in. and forked at ends. Bonding bricks may also be used, and be spaced every 2 ft. 6 in. apart alternately in every fourth course of brickwork. Sometimes ordinary bricks dipped in boiling tar are used.



Hollow walls may be built with an 1 in. (or $\frac{3}{4}$ in.) space between, with the iron or brick ties as before, and the cavity filled in with liquid asphalt; but the brickwork must be fairly dry before the asphalt is applied, and the joints left open, so that it may tie in. The iron or brick ties in this case are not always used.

Cover up walling. (2)—See clause No. 37, under Preliminary Items.

Class of brick. (3)—All bricks, whether as rubbers, facings or in backings, to be good, hard, sound, square, and well burnt, even and uniform in shape and colour, free from cracks, stones, flaws, and other defects, giving a clear ring when struck, and equal to samples to be deposited with and approved by the architect.

No soft or place bricks to be used; but bats to be used only where required for bond. All bricks to be well wetted with clean water through a hose before being laid. All headers to be unbroken.

In some situations where exposed to much wet, bricks are boiled in tar for twelve hours before being used, but of course the work comes out black. They are chiefly employed in cottages.

The various colours in bricks are obtained by the admixture of chalk, iron, silica, alkalies and other substances with clay. Kiln-burnt are better than clamp-burnt bricks. Ordinary building bricks in the London market measure about $8\frac{3}{4}$ in. $\times$ $4\frac{1}{4}$ in. $\times$ $2\frac{3}{4}$ in., but in different parts of the country they vary in size. Rubbers, enamelled bricks, and many facing bricks, are somewhat larger than London stocks.

Rubbers are soft bricks, and can be moulded or carved after having been burnt, but do not in all cases stand the weather so well as bricks moulded and carved before burning.

Grizzle and Place bricks are imperfectly burnt bricks.

The ordinary best building bricks used in and around London are called Stocks, and of a yellow tint, but they vary much in their quality, there are many local-made country bricks, which are superior in every way.

Malms are the best class of Stocks, of a yellowish tint, and used for facings and arches.

Suffolk whites are a whitish tint, and are also used for facings.

Fareham Reds are used as red facings. There are many other good red facing bricks.

Staffordshire and Broseley blue bricks are very hard and strong, and suitable for pavings, copings or any heavy work, or in damp situations. The paving bricks are chamfered or grooved as a foothold.

Salted or salt glazed bricks, and enamelled (commonly called glazed) bricks are used where any special sanitary requirements are essential; the white enamelled bricks are also suitable in dark situations for reflecting light.

Ordinary brickwork in mortar and cement weighs 110 and 112 lbs. respectively per cubic foot, but fire-bricks and similar classes of bricks weigh considerably more. The safe load on brickwork in cement is $5\frac{3}{4}$ tons per super. foot, but if in mortar then $3\frac{1}{2}$ tons. The safe load on brick pillars is one-tenth to one-eighth the breaking weight. Brick pillars should not exceed in height twelve times their least thickness.

Lime. (4)—The lime to be freshly burnt white chalk lime, from Dorking, Merstham or Maidstone.

This is a "fat" lime (that is, calcined from pure carbonate of lime), and only used for temporary buildings or in very poor work. It does not harden well and soon perishes. Hydraulic limes contain a proportion of clay.

or,

The lime to be freshly burnt hard grey chalk (stone) lime, from Halling, Dorking or Maidstone.

This lime is somewhat poor in hydraulicity, but is commonly used.

or,

The lime to be freshly burnt blue lias lime, from Barrow, Rugby or Whitby.

Blue lias lime is a more hydraulic lime in its properties, but expensive.

Hydraulic lime. (5)—The lime to be freshly burnt, specially powerful, and carefully prepared, from Halkin Mountain or Aberthaw.

These are powerful hydraulic limes, suitable for all positions, especially for foundations and damp situations. Mortar made from hydraulic limes should be used at once, as it soon sets. Mortar made with fat limes may be used some time after. Lime for mortar is usually obtained in lumps, then slaked with water (not air) and screened; but it may be used already ground, if fresh.

Selenitic lime. (6)—See clause No. 22, under Excavator.

Portland cement. (7)—See clause No. 23, under Excavator, which would apply here.

Sand. (8)—See clause No. 24, under Excavator, which would apply here.

Sand is not always washed, if clean; but when used with Portland cement it should be specially washed. Broken brick and similar substances, finely ground in a pug or mortar mill, may be substituted for sand.

Lime mortar. (9)—To be composed of freshly burnt, slaked, and screened, grey chalk (stone) lime, and clean, sharp, pit (or fresh-water river) sand, in the proportion of 1 part lime to 3 (or 4) parts sand, measured in boxes, mixed dry on a wood (stone or brick) floor, and water added afterwards, until all parts are completely incorporated and brought to a proper consistency, and prepared on the premises, and made only in sufficient quantities proportionate to the demand.

State if any other lime be used, and in the same proportion, see notes under clauses No. 4 and 5; or if broken brick rubbish be used in lieu of sand, see clause No. 8.

There is no strength in lime itself.

Gauged lime mortar. (10)—The description would be similar to the preceding clause No. 9, but in these proportions: 1 part lime, 1 part Portland cement, to 4 (or 6) parts sand.

When a building has to be run up quickly, gauged mortar will take less time to dry out, in addition to adding to the strengh of the work.

Hair mortar. (11)—The description would be similar to clause No. 9, and in these proportions: 1 part lime to 3 parts sand, and 1 lb. clean, well-beaten bullocks' hair to 2 cubic feet of lime.

Hair mortar in brickwork is only used for screeding in door and window frames, see clause No. 22.

Blue (or black) mortar. (12)—To be composed of 3 parts blacksmith's ashes sifted fine, to 1 part blue lias lime.

or,

Two parts blacksmith's ashes, sifted fine, to 3 parts slaked grey chalk lime, and 4 parts sand. The mortar to be darkened with iron-founder's sand (mineral or vegetable black).

or,

Two parts sifted cupola or forge coal ashes, to 1 part slaked stone lime.

or,

Four parts blacksmith's ashes, sifted fine, to 1 part Portland cement.

Blue mortar is mostly used for pointing brickwork and masonry, or in bedding slates. It is very strong.

Selenitic lime mortar. (13)—To be composed of 1 part selenitic lime to 4 parts sand.

Cement mortar. (**14**)—Cement mortar (unless specified to be neat) to be composed of 1 part Portland cement to 2 (or 3) parts sand, and no cement that has once set to be used. The ingredients to be measured in boxes, mixed dry, and water added afterwards.

In all works requiring great strength, cement mortar should be used; as also in all positions subject to wet, such as foundations. When the work practically always stands in water, the proportion may be 1 cement to 1 sand.

Putty. (**15**)—To be composed of pure lime and clean fresh water.

This is used for white tuck pointing and bedding gauged brickwork.

Limewhite. (**16**)—To be composed of lime, Russian tallow and clean water.

Brickwork. (**17**)—Build the several walls, chimney stacks, breasts and piers upon proper footings with best London stocks (or approved local bricks) carried up in English (or Flemish) bond in lime (or cement or gauged) mortar, according to the several heights, thicknesses and dimensions shown or figured upon the drawings, and plumbed perpendicular. Each course to be well flushed up with mortar (every fourth course is sometimes grouted in liquid mortar, but this does not make such good work). No four courses of brickwork to rise more than $1\frac{1}{4}$ in. higher in mortar than the bricks when laid dry (or state that the joints of brickwork are to be $\frac{3}{8}$ in. thick). Carry up the walls evenly and at regular stages, and no one part is to be raised more than 4 ft. above any other part at any time. Perform all beam filling. (The thicknesses of the various walls may be stated.)

English bond is as a rule preferable for all walls, but is perhaps not so pleasing as Flemish bond.

The London Building Act, 1894, requires that the walls of buildings, when built of brick, stone, or blocks of other hard incombustible material, and situate within the County of London area, shall be at least of certain thicknesses for their several heights and lengths, according as to whether the building in question comes under what is termed in that Act as belonging to:—

"The Warehouse Class."

"The Public Building Class."

"Buildings other than those of the Warehouse Class or Public Building Class" (practically speaking, "Domestic Buildings").

These various stated thicknesses may also be taken as a guide for the thicknesses of brick, stone and similar walls to buildings not situated within the London area, but at the same time reference should be made to the requirements of any Local Acts referring to such other districts.

Under the London Building Act:—

A "Public Building" may be taken as referring to any building where the general public meet for any purpose, such as churches, schools, halls and such like. It also includes hotels, lodging-houses and similar buildings when their cubical contents exceed 250,000 cub. ft., or when they have sleeping accommodation for more than 100 persons. The thicknesses of walls to buildings of this class are not given in the London Building Act, but it states they have to be made of sufficient thickness as may be required by the District Surveyor.

A "Building of the Warehouse Class" may be taken as referring to warehouses, factories and similar buildings; and to any other building when the cubical content exceeds 150,000 cub. ft., which does not come under the heading of "Public Buildings" or "Domestic Buildings."

A building coming under the description of those not belonging to the "Warehouse Class," nor "Public Building Class," may be taken as referring to shops, offices and private houses, as also to hotels, lodging-houses and similar buildings, so long as their cubical contents do not exceed 250,000 cub. ft., nor have sleeping accommodation for more than 100 persons.

The thicknesses of what are termed "Cross Walls" in the London Building Act, may be two-thirds the thickness of external and party walls, but never less than 8½ in. thick. Partitions may be less in thickness.

In hollow walls either the outer or the inner casing must be of the thickness required for external and party walls, but the other casing may be of any thickness.

When walls are built of incombustible material which is not laid in horizontal beds or courses, the London Building Act requires that the walls shall be one-third greater in thickness than the thicknesses given for walls referred to in that Act as being laid in horizontal beds.

Here are the thicknesses of external and party walls to buildings coming under the "Warehouse Class," and laid in horizontal beds.

Read paragraph (*k*) first, which shows what governs the intermediate thickness of a wall between the base and the top.

(*a*) If a wall does not exceed 25 ft. in height, it shall be 13 in. thick at its base, whatever its length.

(*b*) If a wall exceeds 25 ft. but does not exceed 30 ft. in height, and does not exceed 45 ft. in length, it shall be 13 in. thick at its base.

But if the wall exceeds 45 ft. in length, then it shall be 17½ in. thick at its base.

(*c*) If a wall exceeds 30 ft. but does not exceed 40 ft. in height, and does not exceed 35 ft. in length, it shall be 13 in. thick at its base. If the wall exceeds 35 ft. but does not exceed 45 ft. in length, it shall be 17½ in. thick at its base.

But if the wall exceeds 45 ft. in length, it shall be 21½ in. thick at its base.

(*d*) If a wall exceeds 40 ft. but does not exceed 50 ft. in height, and does not exceed 30 ft. in length, it shall be 17½ in. thick at its base. If the wall exceeds 30 ft. but does not exceed 45 ft. in length, it shall be 21½ in. thick at its base.

But if the wall exceeds 45 ft. in length, it shall be 26 in. thick at its base.

(*e*) If a wall exceeds 50 ft. but does not exceed 60 ft. in height, and does not exceed 45 ft. in length, it shall be 21½ in. thick at its base.

But if the wall exceeds 45 ft. in length, it shall be 26 in. thick at its base.

(*f*) If a wall exceeds 60 ft. but does not exceed 70 ft. in height, and does not exceed 45 ft. in length, it shall be 21½ in. thick at its base.
But if the wall exceeds 45 ft. in length, it shall be increased in thickness from the base to within 16 ft. from the top, by 4½ in.

(*g*) If a wall exceeds 70 ft. but does not exceed 80 ft. in height, and does not exceed 45 ft. in length, it shall be 21½ in. thick at its base.
But if the wall exceeds 45 ft. in length, it shall be increased in thickness from the base to within 16 ft. from the top, by 4½ in.

(*h*) If a wall exceeds 80 ft. but does not exceed 90 ft. in height, and does not exceed 45 ft. in length, it shall be 26 in. thick at its base.
But if the wall exceeds 45 ft. in length, it shall be increased in thickness from the base to within 16 ft. from the top, by 4½ in.

(*i*) If a wall exceeds 90 ft. but does not exceed 100 ft. in height, and does not exceed 45 ft. in length, it shall be 26 in. thick at its base.
But if the wall exceeds 45 ft. in length, it shall be increased in thickness from the base to within 16 ft. from the top, by 4½ in.

(*j*) If a wall exceeds 100 ft. but does not exceed 120 ft. in height, and does not exceed 45 ft. in length, it shall be 31 in. thick at its base.
But if the wall exceeds 45 ft. in length, it shall be increased in thickness from the base to within 16 ft. from the top, by 4½ in.

(*k*) A wall shall be 13½ in. thick for 16 ft. down from the top, and the intermediate parts between the base and 16 ft. from the top shall not be of less thickness than would be the case if the wall were built solid throughout the space between straight lines drawn on each side of the wall, and joining the thickness at the base to the thickness at 16 ft. below the top. Nevertheless in walls not exceeding 30 ft. in height, the walls of the topmost story may be 9 in. thick (provided that the story does not exceed 10 ft. in height).

Here are the thicknesses of external and party walls to buildings which are not of the "Warehouse Class," nor "Public Building Class," but which might be termed the "Domestic Building Class."

The thicknesses of the intermediate parts of a wall between the base and the top are given under this class of building.

(*l*) If a wall does not exceed 25 ft. in height or 30 ft. in length, and does not comprise more than two stories, it shall be 8½ in. thick for its whole height. But if the wall exceeds 30 ft. in length, but does not exceed 25 ft. in height, or comprises more than two stories, it shall be 13 in. thick below the topmost story, and 8½ in. for the rest of its height.

(*m*) If a wall exceeds 25 ft. but does not exceed 40 ft. in height, or 35 ft. in length, it shall be 13 in. thick below the topmost story, and 8½ in. thick for the rest of its height. But if the wall exceeds 35 ft. in length and 25 ft. in height, but does not exceed 40 ft. in height, it shall be 17½ in. thick for the height of one story, then 13 in. thick for the rest of its height below the topmost story, and 8½ in. thick for the rest of its height.

(*n*) If a wall exceeds 40 ft. but does not exceed 50 ft. in height or 30 ft. in length, it shall be 17½ in. thick for the height of one story, then 13 in. thick for the rest of its height below the topmost story, and 8½ in. thick for the rest of its height. If the wall exceeds 40 ft. but does not exceed 50 ft. in height, and exceeds 30 ft. in length but does not exceed 45 ft. in length, it shall be 17½ in.

thick for the height of two stories, then 13 in. thick for the rest of its height. If the wall exceeds 40 ft. but does not exceed 50 ft. in height, and exceeds 45 feet in length, it shall be $21\frac{1}{2}$ in. thick for the height of one story, then $17\frac{1}{2}$ in. thick for the height of the next story, and then 13 in. thick for the rest of its height.

(*o*) If a wall exceeds 50 ft. but does not exceed 60 ft. in height, or 45 ft. in length, it shall be $17\frac{1}{2}$ in. thick for the height of two stories, and 13 in. thick for the rest of its height. If the wall exceeds 50 ft. but does not exceed 60 ft. in height, but exceeds 45 ft. in length, it shall be $21\frac{1}{2}$ in. thick for the height of one story, then $17\frac{1}{2}$ in. thick for the height of the next two stories, and then 13 in. thick for the rest of its height.

(*p*) If a wall exceeds 60 ft. but does not exceed 70 ft. in height, or 45 ft. in length, it shall be $21\frac{1}{2}$ in. thick for the height of one story, then $17\frac{1}{2}$ in. thick for the height of the next two stories, and then 13 in. thick for the rest of its height. If the wall exceeds 60 ft. but does not exceed 70 ft. in height, but exceeds 45 ft. in length, it shall be increased in thickness in each of the stories below the uppermost two stories by $4\frac{1}{2}$ in.

(*q*) If a wall exceeds 70 ft. but does not exceed 80 ft. in height, or 45 ft. in length, it shall be $21\frac{1}{2}$ in. thick for the height of one story, then $17\frac{1}{2}$ in. thick for the height of the next three stories, and 13 in. thick for the rest of its height. If the wall exceeds 70 ft. but does not exceed 80 ft. in height, but exceeds 45 ft. in length, it shall be increased in thickness in each of the stories below the uppermost two stories by $4\frac{1}{2}$ in.

(*r*) If a wall exceeds 80 ft. but does not exceed 90 ft. in height, or 45 ft. in length, it shall be 26 in. thick for the height of one story, then $21\frac{1}{2}$ in. thick for the height of the next story, then $17\frac{1}{2}$ in. thick for the next three stories, and then 13 in. thick for the rest of its height. If the wall exceeds 80 ft. but does not exceed 90 ft. in height, but exceeds 45 ft. in length, it shall be increased in thickness in each of the stories below the uppermost two stories by $4\frac{1}{2}$ in.

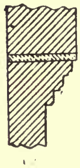
(*s*) If a wall exceeds 90 ft. but does not exceed 100 ft. in height, or 45 ft. in length, it shall be 26 in. thick for the height of one story, then $21\frac{1}{2}$ in. thick for the height of the next two stories, then $17\frac{1}{2}$ in. thick for the height of the next three stories, and then 13 in. thick for the rest of its height. If the wall exceeds 90 ft. but does not exceed 100 ft. in height, but exceeds 45 ft. in length, it shall be increased in thickness in each of the stories below the uppermost two stories by $4\frac{1}{2}$ in.

(*t*) If a wall exceeds 100 ft. but does not exceed 120 ft. in height, or 45 ft. in length, it shall be 30 in. thick for the height of one story, then 26 in. thick for the height of the next two stories, then $21\frac{1}{2}$ in. thick for the height of the next two stories, then $17\frac{1}{2}$ in. thick for the height of the next three stories, and then 13 in. thick for the rest of its height. If the wall exceeds 100 ft. but does not exceed 120 ft. in height, but exceeds 45 ft. in length, it shall be increased in thickness in each of the stories below the uppermost two stories by $4\frac{1}{2}$ in.

(*u*) No story enclosed with walls less than 13 in. thick shall be more than 10 ft. in height (between floor and ceiling or tie of roof).

Cuttings. (**18**)—Perform all rough and fair cuttings to skew-backs, cambers, birds'-mouths, squint quoins, ramps, splays, chamfers, chases or other cuttings.

Oversail.



(**19**)—Oversail for plates, chimney-breasts, stacks, cornices and other parts. (See clause No. 46.)

When a breast or other like projection has no wall of the same width immediately under, a tooled York stone corbel may be fixed, in addition to the sailing out, see Mason, clause No. 32.

Bed plates, stone and other work.

(**20**)—Bed in mortar all plates, lintels, terra-cotta, stone and other work; make good after Mason and pin up tight.

Generally build in.

(**21**)—Build in all templates, corbels, brackets and other work; cut all holes for pipes, and generally attend upon, cut away for, and make good after all other trades.

Cut, tooth and bond, and prepare surfaces of old walls for new.

See clause No. 50 in Preliminary Items, which may be inserted here.

Bed and point frames.

(**22**)—Bed and point in cement all door and window frames.

State if screeded in lime and hair mortar instead. Clause No. 11 describes the mortar to be used in the screeding in of frames.

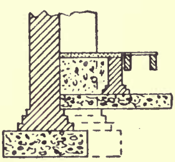
Bed sills and thresholds.

(**23**)—Bed stone sills and thresholds hollow, and point up.

Wedge and point to flashings.

(**24**)—Rake out joints of brickwork to flashings, wedge up with lead (or oak) wedges, and point in cement.

Fender walls.



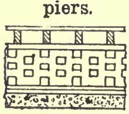
(**25**)—The fender walls to ground floor fireplaces and hot plate, to be built with proper footings, and carried up 15 in. high one brick thick, in cement mortar. Fill in the space for front and back hearths in cement concrete, and level up ready for the stone hearths.

For hearths, see Mason, clauses Nos. 51 and 122; Pavior, clauses Nos. 5 and 6; and Bricklayer, clause No. 42.

Cellar and boiler-house under ground.

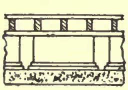
(**26**)—Build cellar and boiler-house walls in cement mortar up to ground damp course level.

Sleeper walls or piers.



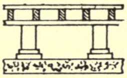
(**27**)—Build every 5 ft. apart "honeycomb" (or "pigeon hole") sleeper walls one brick thick in cement mortar on footings, to carry ground floor joists.

or,



Sleeper walls to be built one brick thick with footings, in 4 ft. lengths, with 9 in. spaces between.

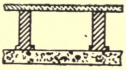
or,



Build 14 in. square brick piers with footings, every 5 ft. apart in cement mortar, to carry ground floor joists.

The wood plates must be strong in this case to carry the joists. All piers should be built in cement mortar, whether to carry small or great weights.

Sleeper walls for pavings.



(**28**)—Build every 3 ft. apart "honeycomb" (or "pigeon hole") sleeper walls in cement mortar half a brick thick on footings, to receive stone paving in areas and scullery.

When stone paving is not laid direct on the concrete. For paving, see Mason, clauses Nos. 41 to 44, 85 to 87, and 118.

Footings in cement.

(**29**)—All footings and walls up to damp course level to be built in cement mortar; as also to the garden and fence walls.

It is better work to do so, although they are often built in lime mortar. Footings to garden fence walls are seldom built in cement mortar.

Parapets.

(**30**)—All parapet walls to be built 12 in. down in cement mortar.

For various forms of brick coping to parapet walls, see notes to clause No. 98.

Eaves.

(**31**)—All walls under eaves to be built in cement mortar 12 in. down.

Sleeper walls to scullery sink.

(**32**)—Build two (or more) $4\frac{1}{2}$ in. sleeper walls in cement mortar to carry sink, finished with a neat struck joint.

In best work these walls may be built in salt glazed or enamelled brickwork 9 in. thick, with bull-nose edges. Sinks are also carried on galvanised iron or slate brackets.

For sinks, see clause No. 91; Carpenter, clause No. 288; Mason, clauses Nos. 55 and 97; Plumber, clause No. 33; and Slater, clause No. 21.

Circular brickwork.

(**33**)—Build all circular brickwork in cement mortar.

State if it be all in headers. Circular work under 25 ft. radius does not look well if built in ordinary stretcher and header work. If the radius be very small, the joints will be very large on the external curve, unless the bricks be cut to the radius.

Arches to openings in circular brickwork should be well tied into the back of the wall, or they are liable to fall out.

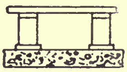
Underpinning. (34)—The underpinning to (say) south and west walls to be built in hot cement (or hot lime) mortar, in lengths not exceeding 3 ft. at a time. The excavating, concrete and shoring to be executed in short lengths also.

See Excavator, clause No. 33, for concrete underpinning.

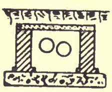
Access holes. (35)—Leave holes in cross walls under ground floor for access to heating pipes, and form a door opening in main wall, with York sill, brick arch, 2 in. deal four-panel door and frame, shoes and fastenings.

This clause will only apply where heating, or other pipes, run through inaccessible positions under ground floors.

Piers for heating pipes.



(36)—Build 14 in. square brick piers on footings in cement mortar, for supporting heating pipes under floors, with 2 in. tooled York stones on top. (See Mason, clause No. 38.)



When pipes are in channels, describe the concrete bottom 6 in. thick, with half-brick in cement sides on footings, and stone coverings, see Mason, clauses Nos. 35 and 36. If the channels be deep, the sides will require to be one brick thick.

Chases for pipes. (37)—Form chases for hot-water, cold-water, heating and other pipes.

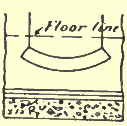
Cores for columns. (38)—The brick cores for the diminished columns (when cemented over), to be built in cement mortar, and rough cut to the section, the joints being raked out as the work proceeds.

For cement face, see Plasterer, clause No. 71.

Rough arches. (39)—Form rough relieving arches, in two half-brick rings in cement mortar, over all internal openings, springing from the ends of lintels. Turn counter-arches where necessary.

These arches may also be formed in roughly axed arches, but are not so strong.

Inverts.

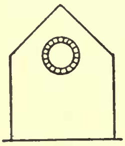


(40)—Turn rough inverts, in two half-brick rings in cement mortar, under all door, window and other openings on ground floor.

Invert arches are not much used in ordinary work, as, unless very well done, they do more harm than good; they are employed to distribute the weight more equally on the foundation.

or,

A special clause for a circular arch with invert in an old wall.

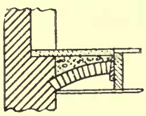


Cut out for, and insert a red brick circular arch with invert in two half-brick rings in cement mortar, to a 3 ft. opening (say) 25 ft. up from the ground, in the 14 in. gable wall, including the scaffolding, the centre, and all cutting, facing, pointing and making good to work round and about same, inside and out.

Drain arches.

(41)—Turn rough arches in one half-brick ring in cement mortar, over drain pipes passing through or under walls. (See Drainage, clause No. 17.)

Trimmer arches.



(42)—Turn half-brick coach-headed trimmer arches in cement mortar, against 4 in. × 2 in. feather-edge springers, to all fireplace openings above ground floor level, 18 in. longer than their respective openings and 18 in. wider, level up the top sides in cement concrete to receive hearths, and leave centering in to receive the lathing under.

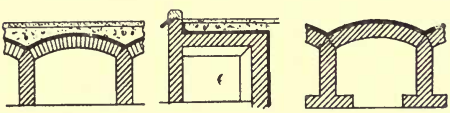
or,

level up the top sides in cement concrete, composed of 1 part broken brick (or ballast) to a $\frac{3}{4}$ in. gauge, and 1 part Portland cement, floated and trowelled over in $\frac{3}{4}$ in. thick neat cement as hearths, and leave centering in to receive lathing under.

See notes to clause No. 25 for other various forms of hearths.

Cellar arches, vaults or groinings.

(43)—Turn rough arches over cellars in cement mortar, in two (or three) half-brick rings, form the external cambered walls one brick thick, and flat joint, point the inner sides and faces as the work proceeds.

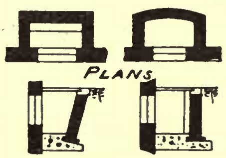


SECTIONS PLAN

Lay $\frac{1}{2}$ in. mastic asphalt over the tops of arches up to kerb line, and against the walls where earth abuts at back.

For slate creasing, see Mason, clause No. 50.

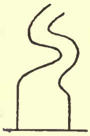
The cellars might be formed with axed cambered arches one brick thick, and the outer faces may be cemented over to keep out the wet, see Plasterer, clause No. 64; or slates and cement may be used, see Slater, clause No. 14.

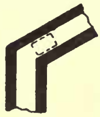


SECTIONS

Small areas covered with pavement lights, may either have the back wall battered or cambered, all the walls being built in cement and lined on the outer side by any of the methods just described, the inner sides may be built in enamelled brick or lined in tiles, see clauses Nos. 84 and 89a.

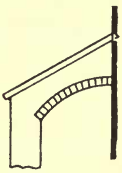
Smoke flues.





(44)—Carry up a separate smoke flue to each fireplace and copper, as straight as possible, with easy bends, turn and gather the necks over the openings quickly, and form the pockets to sketch; parget the whole length of flues with cow dung mortar, composed of 1 part cow dung to 4 parts hair mortar, and core before setting the stoves. Kitchen flue to be 14 in. × 9 in.; boiler flue 18 in. × 14 in. (or other size); all other flues 9 in. × 9 in. In all bends at a less angle than 45°, double soot doors and frames are to be placed for sweeping. Render in plaster all flues and chimney breasts in roof portions. (See Plasterer, clause No. 47.)

The brickwork round flues is generally $4\frac{1}{2}$ in. thick, but 9 in. is better. An arch similar to that described in clause No. 78, may be required to carry a flue where it crosses a void externally, with a stone coping on top.



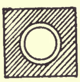
The divisions dividing flues are called "withes," they are generally $4\frac{1}{2}$ in. thick. For hair mortar see clause No. 11.

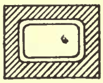
See Smith, notes preceding clause No. 81, with reference to flues.

Flue pipes.

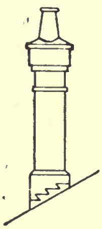
(44a)—Instead of pargeting flues, they may be lined with fire-clay flue pipes, either oblong or cylindrical, socketed or plain. State which.

Fire-clay flue pipes are made in 6 in., 8 in., 9 in., 10 in. and 12 in. diameters, or 16 in. × 10 in., 14 in. × 9 in., 12 in. × 9 in. and 10 in. × 6 in. oblongs, and generally in 2 ft. lengths. They form excellent flues, and in some positions where space is an object they are invaluable.





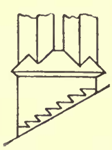
Chimney stacks and pots.



(45)—Build the whole of the shafts where they appear above the roof in cement mortar. Finish the tops with projecting courses in red brick, and put to each flue a terra-cotta chimney pot, p.c. 3s. 6d. each, bed and flaunch round in cement, and run cement filleting round top of sailing courses. Form the plinths with $2\frac{1}{4}$ in. splay.

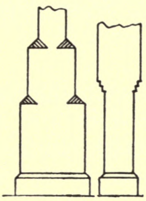
Plain chimney pots are made in 2 ft., 2 ft. 6 in., 3 ft., 4 ft., 5 ft. and 6 ft. heights; those from 4 ft. high are generally called "tall boys." Chimney pots may be very elaborate in design, and may be obtained in the same heights as ordinary pots.

Describe any other dressings to the chimney stacks, such as panels, pilasters, arches. State if they are to be built angle wise, if octagonal, and if with bases tumbled in.



See Smith, clause No. 23, for iron ties to chimney stacks.

Tumbling in.

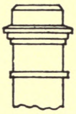


(46)—Where the chimney stacks diminish from the base upwards, they are to be "tumbled" in with red brick in cement mortar.

The sketches show "tumbling in" and oversailing.

Sometimes external chimney stacks require oversailing. See clause No. 19.

Small boiler shaft.

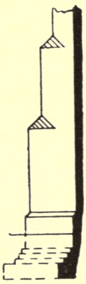


(47)—Build the boiler shaft in lime mortar for some 20 ft. above the fire level, and the remainder in cement mortar, and point the inside with a careful flush joint. Line shaft 10 ft. up in fire-brick. Finish the top with oversailing courses in cement mortar with weather filletings, and a York stone chamfered capping 9 in. deep, cramped together with slate.

Boiler flues should not be pargeted.

Cement mortar will not stand the direct action of great heat, either fire-clay or lime mortar must be used. For tall chimney shafts see clause No. 115.

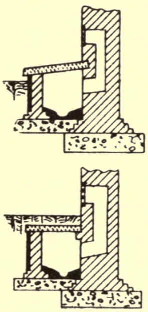
Buttresses.



(48)—The buttresses to be built up with the walls, and the splayed surfaces tumbled in with red brick in cement mortar.

Buttresses are built to take the thrust of an arch or some cross wall. In old work they may be used to strengthen or prop up a wall liable to fall out. Sometimes they are merely ornamental.

Dry areas.



(49)—Form a dry area 12 in. wide all round building where the ground abuts, with 9-in. brick walls in cement mortar, and built down to the level of the concrete under the main footings. Render the outside in cement and sand 1 in. thick. Cover the top with a 2-in. tooled (or rubbed) hard York stone in lime mortar, tilted (or weathered) a little above earth level, made movable, and pinned into wall. The channel or floor to be formed in cement concrete rendered up to falls, and provided with 9 in. × 6 in. cast-iron air gratings for ventilation every 10 ft. apart.

The stone top may rest on a brick projection built out from the main wall. It may also be laid just beneath an earth covering. Stout slates may be used in place of stone. See Mason, clause No. 34.

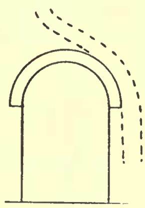
Fireplace arches.

(**50**)—Turn 9 in. cambered arches in cement mortar to all fireplace and range openings, upon 3 in. (or $2\frac{1}{2}$ in.) $\times \frac{1}{2}$ in. (or $\frac{3}{4}$ in.) wrought-iron cambered chimney bars, with ends caulked and turned up and down, and built 9 in. into piers on either side.

In some large range openings it is impossible to get an arch over, in that case the iron chimney bar may be a small rolled wrought-iron or steel joist, see Smith, clause No. 63. A fireplace arch usually springs 3 ft. 3 in. up from the floor; in ranges it varies considerably.

Arches for flues over voids.

(**51**)—Turn 9 in. internal rough arches in cement mortar to carry flues, where they come over voids.



Soot door openings.

(**52**)—Form arched opening for soot doors to flue of boiler shaft, with a stone sill, ready to receive soot door frames. Form openings for soot doors to other flues.

Only large openings require arches and sills.

Set stoves.

(**53**)—Set all stoves and ranges solid in fire-brick and fire-clay, and point up in cement.

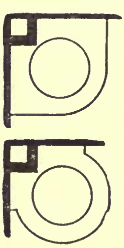
If not built up solid, soot will accumulate at the back of the stoves. When a new stove is put into an old opening, it is impossible with some stoves to build them up solid without disturbing the chimney-piece, in that case they may be filled in with fine cement concrete, thrown in by hand through the register opening, see Smith, clause No. 82.

Fire-brick round ranges.

(**54**)—The kitchen and scullery ranges and hot plates to be built round with fire-brick sides in fire-clay.

It is always well to build with fire-brick around any position where there may be exceptional heat.

Copper.



(**55**)—Build the copper in scullery on a 9 in. concrete bed with 9 in. fire-brick sides on footings in fire-clay, with rounded corner and proper flue and ashpit. Put a heavy cast-iron furnace door and frame, with furnace bars and damper, and two cast-iron double soot doors in frames.

Set in brickwork a strong made riveted heavy metal copper pan 2 ft. diameter, holding 40 gallons, and weighing not less than $1\frac{1}{2}$ lbs. per gallon (or a galvanised iron pan), with a 1 in. stout copper riveted outlet arm and gun-metal cock, p.c. 12s.

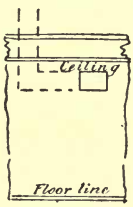
Render the sides and top in cement and sand $1\frac{1}{4}$ in. thick, finished a trowelled face, with the top edges slightly chamfered (or rounded) off. Form a 7 in. × $\frac{3}{4}$ in. cement skirting round two sides, with circular corners.

The copper lid to be circular, in elm (or beech), wrought and rebated together in two 1 in. (or $\frac{3}{4}$ in.) thicknesses, with joints crossing, and nailed with copper nails 6 in. apart, well clenched. The handle to be out of 2 in. × $1\frac{1}{2}$ in. elm, sunk and rounded at top, and fixed with four copper (or brass) screws $2\frac{1}{2}$ in. long, and the whole put together with white lead.

The lid may be dowelled together, and pinned with oak pins.

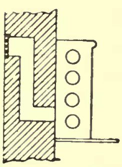
For a portable copper, see Smith, clause No. 68; and Carpenter, clause No. 280.

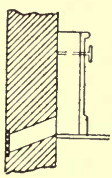
Outlet ventilating flues.



(56)—Form outlet ventilating flues to each room 9 in. × $4\frac{1}{2}$ in. (or 9 in. × 9 in.), carried along the inside of wall for a distance of 4 ft., and up by the side of the smoke flues, parget and core same, and provide on the inside with mica flaps (or hit-and-miss gratings), p.c. 5s. each, and finish at the top of stack with iron grating 9 in. × 9 in., one on either side, and with similar pots to match the smoke flue pots, but filled up solid in brickwork in cement. These pots are only required for the sake of uniformity.

Air inlets.





(57)—Form (say) twelve air-inlet flues 9 in. × $4\frac{1}{2}$ in. to coils, and finish externally under window sills with 9 in. × 9 in. brass (or iron) hit-and-miss gratings. Render the flues smooth in cement.

also,

Form (say) twelve air-inlet flues 9 in. × $4\frac{1}{2}$ in. on the slant for the "Tobins" tubes, with 9 in. × 6 in. perforated iron gratings on the outside. Render the flues smooth in cement.

A sum may be provided here for the "Tobins" tubes, otherwise describe them, see Carpenter, clause No. 312.

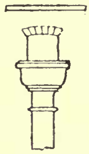
Air bricks.

(58)—Build in where directed for ventilation to the ground floor, and put (say) twenty 9 in. × 6 in. terra-cotta (or iron) air bricks, form flues to same, and render in cement.

See Smith, clause No. 40.

Air bricks are not required for upper floors unless they have a free passage for air, such as in double floors.

Openings to rain-water heads.



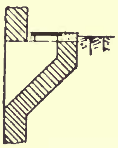
(**59**)—Form (say) six outlets from gutters to rain-water heads, with arches turned over in a half-brick ring, and the openings rendered out in cement.

This is when the gutter outlet itself discharges through a brick wall, see Plumber, clause No. 9.

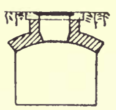
All holes.

(**60**)—Form all other holes, with arches if required, for any purpose.

Coal shoot.



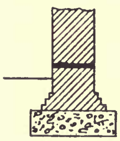
(**61**)—Form coal shoot with brickwork in cement mortar, and fill in opening with a 14 in. diameter perforated iron coal plate and fastening, let into a 6 in. rubbed York stone curb 3 ft. square, fixed $\frac{1}{2}$ in. above ground (or paving) level, with the arrises taken off. (See Smith, clause No. 65.)



In coal cellars under the street paving the shoot is formed vertically in the arch of the cellar, and the stone kerb to the coal plate must be kept level.

One ton of coal occupies from 39 to 48 cub. ft.

Damp course.

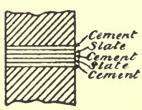


(**62**)—Lay over the surface of all walls the full thickness of same, and 3 in. above the ground level a continuous course of mastic asphalt $\frac{1}{2}$ in. ($\frac{1}{4}$ in., $\frac{3}{8}$ in. or $\frac{3}{4}$ in.) thick, applied hot, and well sanded over before cooling.

or,

Lay over the surface of all walls, the full thickness of same, $2\frac{3}{4}$ in. (or $1\frac{1}{2}$ in.) improved glazed stoneware damp course, with tongue and groove joints and proper angle pieces, and bedded and jointed in cement mortar.

or,



Lay over the surface of all walls, the full thickness of same, a double course of stout Welsh slates (about $\frac{1}{4}$ in. thick each), well lapped at joints, and bedded and jointed in neat cement $\frac{3}{8}$ in. thick; the course of brickwork above and below being built in cement mortar.

Sheet lead and asphalted felt are also used as a damp course.

Damp course to parapets.

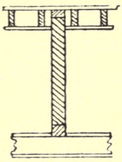
(**63**)—Lay over all brick parapet walls and gables just below coping, the full width of walls, mastic asphalt $\frac{1}{2}$ in. thick, applied hot, and well sanded before cooling.

or,

Lay over all parapet walls and gables just below coping, the full width of walls, a double course of stout Welsh slates (about $\frac{1}{4}$ in. thick each) well lapped at joints, and bedded and jointed in neat cement $\frac{3}{8}$ in. thick.

This upper damp course is a precaution against wet penetrating the walls from the top.

Half-brick walls.



(**64**)—Build all half-brick walls in cement mortar, and where supported on the floors, lay $4\frac{1}{2}$ in. × 3 in. sills and heads, the heads being level with the flooring above, and stiffened between the joists with fir blocks.

Brick-nogged partitions.

(**65**)—Build in cement mortar half-brick nogged partitions, with $4\frac{1}{2}$ in. × $\frac{3}{4}$ in. ($\frac{1}{2}$ in., $1\frac{1}{2}$ in. or 2 in.) horizontal nogging pieces every 3 ft. high, $4\frac{1}{2}$ in. × 3 in. quarters every 3 ft. apart, and $4\frac{1}{2}$ in. × 3 in. sills and head pieces.

Brick-nogged partitions may be built with the bricks laid on edge, but they are seldom now used at all, as the timber rots and is a source of weakness. See Carpenter, clause No. 138.

Hoop iron.

(**66**)—Build in one row of galvanised hoop-iron bond $1\frac{1}{4}$ in. × $\frac{1}{16}$ in. (or $1\frac{1}{2}$ in. × $\frac{1}{16}$ in.), in all walls to every half brick of thickness, commencing 2 ft. 6 in. above the ground line, and continuing every 5 ft. (or 6 ft.) above, the joints and angles to be well hooked together, and the whole to be well tarred and sanded. The courses of brickwork taking the bond to be built in cement mortar.

Hoop iron is made in the following thicknesses (gauges) and widths:—

B. W. G.	21	thick by	$\frac{5}{8}$ in.	wide.
„	20	„	$\frac{3}{4}$ in.	„
„	19	„	$\frac{7}{8}$ in.	„
„	18	„	1 in.	„
„	17	„	$1\frac{1}{8}$ in.	„
„	16	($\frac{1}{16}$ in.)	$1\frac{1}{4}$ in.	„
„	15	„	$1\frac{3}{8}$ in.	„
„	15	„	$1\frac{1}{2}$ in.	„
„	14	„	$1\frac{3}{4}$ in.	„
„	13	„	2 in.	„
„	13	„	$2\frac{1}{4}$ in.	„
„	12	„	$2\frac{1}{2}$ in.	„
„	11	($\frac{1}{8}$ in.)	$2\frac{3}{4}$ in. and 3 in.	wide.

Up to $1\frac{1}{2}$ in. wide it is used for floor tongues, above that for walls.

Bull nose.

(67)—The angles to piers, and reveals of doors in yards and cellars, to be built with blue brick bull-nose quoins.

Wherever there is any rough usage, bull-nose angles should always be specified, especially in outbuildings and stables; they may be in red brick, or other kind. Brick sills may be in blue bull-nose, or red or blue chamfered bricks, see Carpenter, notes on clause No. 144.

External facings and pointing to main walls.

(68)—Face all external walls and chimney stacks of main building with approved picked best selected bright stock facing bricks (or washed malm, or Suffolk red or white, or Luton plum colour, or red Fareham, or any other approved local red or other colour facing bricks). All headers to be whole bricks. Point with a weather joint as the work proceeds, in bright washed sand and lime, slightly coloured with (ochre) pigment,

or,

rake out joints afterwards when striking scaffold, and tuck point in fine stuff,

or,

rake out joints afterwards when striking scaffold, and point a weather joint in cement,

or,

rake out joints afterwards when striking scaffold, and point in blue ash mortar a flat joint.

A weather joint is the best form of joint for withstanding the weather.

Facings to other parts.

Face the external walls and chimney stacks of remaining parts and outbuildings, in picked bright stocks, finished a weather-joint as the work proceeds.

Old walls repointed.

(69)—Erect scaffold, rake out joints of brickwork, fill up, stain, and tuck point in fine stuff.

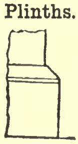
It may be weather pointed in cement, instead of being tuck pointed.

Dressings.

(70)—The window and door dressings, bands, plinths, eaves, and the oversailing courses to chimney stacks, to be in red Fareham (or other) bricks.

This is a general covering clause as far as it goes, but the following clauses, Nos. 71 to 76, give dressings more in detail.

Plinths.



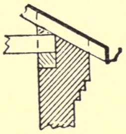
(71)—The plinth course to be 15 in. high, projecting $2\frac{1}{4}$ in. from face of main walls, and formed in red Fareham (or other) bricks, finished off on top with a blue Staffordshire (or other) brick splay.

Strings and pilasters.

(**72**)—The strings, mouldings, pilasters, cornices and sills, to be cut, rubbed and moulded in red Fareham rubbers, set in fine putty, and the projections weathered off on top in cement.

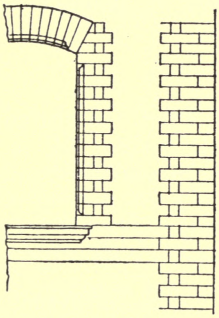
Give the sizes of the various parts, together with any carving or sinkings. State if they are to be in ordinary moulded brick instead of being cut and rubbed. Sheet-lead weathering is sometimes put to strings instead of cement, see Plumber, clause No. 66.

Eaves course.



(**73**)—Finish the eaves course with red Fareham bricks, in three projections of 1 in. each, carried up under the eaves.

Reveals and quoins.



(**74**)—The reveals of windows and doors, the quoins of building and bands, to be in squared and rubbed red brick rubbers, set in fine putty, the window and door dressings being stop moulded.

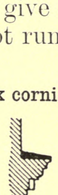
The arches would also require moulding to be in uniformity. If the bands project, give the projection, and describe a cement weather fillet on top. State the width of quoins and dressings. Window and door openings may have moulded rubbed brick architraves.

Frieze.

(**75**)—The ornamental carved frieze to be in squared and rubbed red brick rubbers, set in shellac, and the carving to be carefully executed.

Or give a price for the carving, either as an inclusive sum or price per foot run (or super.). State if there be carving to any other part.

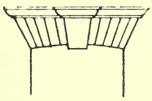
Brick cornice.



(**76**)—Form the cornice in cut, rubbed and moulded red brick rubbers, with dentil course, and cement weather fillet on top.

Also see notes to clause No. 72. For brick coping see notes to clause No. 98. Sheet-lead weathering is sometimes put to cornices instead of cement, see Plumber, clause No. 66.

Gauged arches.



(77)—Turn over all external openings in red Fareham rubbers (malms, or Suffolk whites), cut and gauged straight arches 12 in. deep, correctly rubbed and set in fine putty, with a $\frac{1}{2}$ in. camber underneath, and backed up in cement.

Cambers to straight arches should be from $\frac{1}{6}$ in. to $\frac{1}{8}$ in. per foot span, otherwise they will appear to drop in the centre.

If there be stone keys, they might be described here with the arches; or if there be brick labels, describe them as "cut, moulded and mitred labels 3 in. deep, with cement fillet on top." The labels may be in stone.

Half-brick ring arches.

(78)—The external arches to outbuildings to be in two half-brick (stock or other kind) rings, in cement mortar (or in axed stocks or other kind).

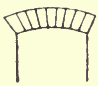
See notes to clause No. 44 for arches to carry flues over great voids, which may perhaps require three half-brick rings.

Niches.

(79)—The niches to be built in cut and rubbed red brick Fareham (or other) rubbers set in shellac, and half domed at top.

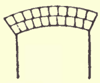
The sills may be in stone or rubbed brickwork to match.

Other arches.



(80)—Turn external axed red brick cambered (segmental, semicircular or elliptical) arches 14 in. (or 9 in.) deep, with a 2 in. rise to all other window and door openings, in cement mortar.

or,



in three (or two) half-brick rings in cement mortar.

Arch to pig tub.

(81)—Form opening in scullery wall near pig tub, with brick arch and stone sill, $1\frac{1}{2}$ in. one-panelled door with 4 in. butts and fastenings, and $1\frac{1}{2}$ in. rebated and beaded linings, head and window board.

This opening is sometimes put in a scullery wall, for the servants to throw the bits through into the pig tub outside.

Internal facings.

(82)—Face the inside of scullery, w.c., and basement passages with picked stocks, finished with a neat struck trowelled flat joint as the work proceeds.

If any other parts are not plastered, then describe the facings in a similar manner.

Cellars.

(83)—Face the cellars with hard blue Staffordshire (or ordinary stock) bricks, with joints struck fair as the work proceeds.

Enamelled brick facings to areas (in dark places).

(84)—Face the areas with best (or seconds) white enamelled bricks, finished a weather joint.

Also see clause No. 89a for tiling to areas.

Enamelled brick facings to lavatory, w.c. and bath-room.

(85)—Face the best w.c. and lavatory on ground floor, and bath-room on first floor, with cream (or white) enamelled bricks, with coloured skirting, dado and frieze band, finished a ruled joint in Parian.

See also clause No. 89a for other tiling. W.c.'s in any position may be faced with enamelled brickwork.

Pointing to enamelled brickwork generally.

(86)—Rake out the joints to enamelled brickwork and point in Parian (or coloured Parian) a ruled joint.

When a wall is faced with white enamelled bricks, a little yellow or pink tinting to the pointing adds much to the effect.

Enamelled and glazed brick facing to kitchen.

(87)—Face kitchen walls 3 ft. high in salt glazed brickwork pointed in cement, and above in white enamelled bricks pointed in tinted Parian.

Enamelled bricks may be used in any position where light or great cleanliness is desirable.

Wall tiling.

(88)—Line the walls of lavatory with $\frac{3}{8}$-in. best white (or cream) glazed tiles in 6-in. squares, set in neat Portland cement on a backing of Portland cement and sand, with a 3-in. ornamental dado border, and a dark skirting 12 in. deep, and pointed in tinted Parian.

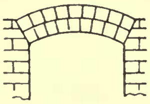
Tiles 6 in. × 3 in. × $\frac{3}{8}$ in. are also much used. In old plastered walls the plastering must be hacked off and the walls rendered over in cement and sand before the tiling is fixed. See also clause No. 89a and notes. A little washed sand is sometimes added to the cement for setting wall tiles.

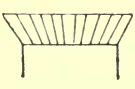
Internal enamelled and glazed brickwork generally.

(89)—Face all walls internally in first quality enamelled brickwork, with joints $\frac{1}{8}$ in. (to $\frac{1}{4}$ in.) thick, and with headers unbroken. The dado to be 3 ft. high, in salt glazed (or dipped salt glazed—a superior finish) bricks pointed a flush joint in tinted mortar, with a flush moulded brick dado rail 3 in. deep. The skirting to be pointed 12 in. up a flush joint in cement.

The filling to be in white enamelled bricks, pointed a flush joint in tinted Parian, with a 6-in. tinted frieze band above.

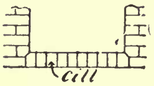
If there be a wood skirting or cornice, state that the brickwork at the back of skirtings and cornices may be in plain stock bricks.





All angles and arrises to projections, piers, openings, window reveals, sills and heads, door jambs and heads, and arches, to be in enamelled bull-nosed bricks.

Turn white enamelled brick segmental (semicircular or elliptical) arches over all openings and windows, in two (or more) half-brick rings, with bull-nose arrises. Cut the mitres to the bull-nose bricks only three parts down the depth of the lowermost horizontal brick springers. Turn white enamelled brick, cut and gauged, straight arches 12 in. deep over all door heads, with



bull-nose arrises, and the mitres formed the same way as to windows.

Form the window sills in white enamelled bull-nose bricks, with the mitres formed the same way as to window arches.

Enamelled brickwork is mostly used in hospitals, sanatoriums, and other positions where light or great cleanliness is required.

For wood cornices and skirtings, see Carpenter, clauses Nos. 206, 210, and 192 to 198 respectively.

For plaster cornices and skirting, see Plasterer, clauses Nos. 9, 29 to 34, 37, 40 and 52 and 53 respectively.

When the soffit of a straight enamelled arch shows, the bricks will have to be made specially.

If the door heads are curved, of course the arches would follow the sweep, and may be in half-brick rings. The arches to openings and windows with curved heads may be cut and gauged.

← Arches to Doors → *← Arches to Windows →*

If the window heads be straight, the arches should be cut and gauged straight arches.

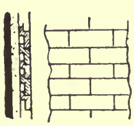
In this class of work the door frames may be solid, finishing flush on the one side, and no architraves or linings will be required.

The window frames may be built in the walls without linings, architraves or window boards; but if the frames show on the inside, a small deal moulding, say 1 in. × $1\frac{1}{2}$ in., may be described round as a finish; see Carpenter, notes to clause No. 144.

Enamelled bricks may either be white or almost any tint. Salt glazed bricks are always a brown shade. Enamelled bricks are commonly called glazed bricks.

Enamelled or glazed brickwork externally would be described similar to interior work, but the pointing should be a weather joint, either in mortar or cement, and the window sills might be in stone. See clauses Nos. 84 to 87, for enamelled and glazed brickwork in certain positions.

Patent hanging tiles.



(89a)—Old walls may either be faced with enamelled or salt glazed bricks; or where space is an object, then with patent hanging tiles, thus:—

Rake out joints of brickwork, render over in cement and sand, and line the walls with patent hanging tiles (state tint) set in cement, and pointed in tinted Parian.

Give the position of the work, and describe any cornices or skirtings, see Carpenter, clauses Nos. 206, 210, and 192 to 198 respectively; and Plasterer, clauses Nos. 9, 29 to 34, 37, 40 and 52 and 53 respectively.

Patent hanging tiles are made 9 in. × 3 in. × about $\frac{3}{4}$ in. thick, and including the nick about $1\frac{1}{4}$ in. thick. These tiles may be nailed on to battens where necessary. For other wall tiling see clause No. 88. Old walls to external areas or similar positions may be lined with 9 in. × 3 in. × 1 in. (or 6 in. × 3 in. × 1 in.) white glazed tiles, set in cement and pointed a weather joint. When internal walls are tiled, and the window, door and other openings have no wood linings, state that all angles are to be finished with glazed angle beads. The frames may be grooved to receive the tiles.

Internal tiling to walls may be very varied in design, and the skirting, dado band, frieze, cornice, panel or other mouldings may be raised from the general face. It is better in this case to state an inclusive sum.

Internal arches. (**90**)—Turn over the internal openings in scullery, w.c., passages, and positions where not plastered, rough relieving arches in two half-brick rings in cement.

Scullery sink. (**91**)—The sink to be p.c. 15s., 3 ft. × 2 ft., in dished glazed stoneware, 6 in. deep inside, with rounded corners and hole cut and rebated for a 3 in. grating, and one (or two) edge cut and pinned into wall in cement.

Also made 20 in. × 15 in. × 5 in. deep, 24 in. × 16 in. × 5 in. deep, 30 in. × 18 in. × 5 in. deep; and in buff glazed ware, 24 in. × 17 in. × $3\frac{1}{2}$ in. deep, 30 in. × 19 in. × 4 in. deep, 36 in. × 22 in. × $4\frac{1}{2}$ in. deep, 42 in. × 24 in. × 5 in. deep; and in angular sinks, 24 in. × 3 in. deep, and 28 in. × $3\frac{1}{2}$ in. deep.

The bearers may be described here, see clause No. 32. Sinks are sometimes cut and dished out of natural stone, but they get very greasy and dirty. See notes to clause No. 32 for other kinds of sinks.

Cement fillets. (**92**)—Run cement filletings along all gables, chimney stacks, and where roofs abut against walls. The cement filleting to be composed of equal proportions of cement and sand, mixed with cast-iron nails and tarred twine.

Commoner filleting is done in mortar; but whether in cement or mortar it is only used in inferior work, as it takes the place of lead flashings. In pantiled roofs cement filleting is usually employed.

Limewhiting. (**93**)—Twice limewhite walls of areas, scullery and passages, and walls and roof timbers of outhouses.

also,

Twice limewhite walls and ceilings of boiler-house and cellars.

See clause No. 16, and Plasterer, clauses Nos. 15 and 62.

Old walls re-limewhited. (**94**)—Broom down, wash and twice limewhite walls. (State where.)

See notes to preceding clause.

Colouring. (**95**)—Twice colour walls of scullery, larder and passages (or other walls).

This should come more properly under Painter.
See Plasterer, clauses Nos. 17 and 61.

Putlog holes. (**96**)—Carefully stop up all putlog holes, and match the mortar and bricks.

Window to servants' w.c. (**97**)—The servants' w.c. in yard to have a 2 ft. × 1 ft. 6 in. cast-iron perforated grating built in the brickwork, with stone sill and brick arch.

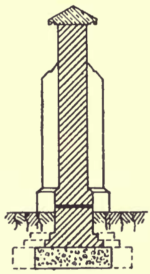
BRICK BOUNDARY WALLS.

(Clauses Nos. 98 and 99.)

For flint boundary walling, see clauses Nos. 105 to 107; and for rubble stone walling, see Mason, clause No. 109.

For timber fencing, see Carpenter, clauses Nos. 325 to 329.

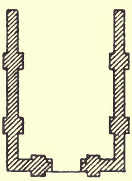
Excavate and concrete.



(**98**)—Excavate the ground to the extent shown upon the drawings, level up and prepare the trenches to receive concrete, part fill in and ram, and spread surplus earth.

Lay cement (or lime) concrete under walls 6 in. thick, 3 in. wider each way than the lowest footing.

Walls.



Enclose (say) the north, south and east sides of the property, with boundary fence walls, piers and footings, built in 9 in. brickwork in picked stocks, carried up in Flemish bond in lime mortar 7 ft. high above ground line, and finish a weather joint as the work proceeds. (See note to, and clause No. 29.)

Plinth. The plinths to be formed on both sides of walling with a $2\frac{1}{4}$ in. projection, in chamfered blue Staffordshire bricks.

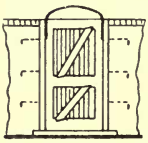
Coping. Cope walls with blue Staffordshire, twice-throated, saddle-back brick coping 12 in. (or 13 in.) wide, bedded and jointed in cement, with returned angle pieces at angles and ends.

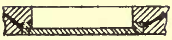
Damp course. Lay a damp course 3 in. above ground line, the full thickness of walls and piers, composed of a double course of Welsh slates, lapped at joints, and bedded in neat cement.

Piers. The piers to be 18 in. square, every 10 ft. apart, carried up two-thirds the height of the walls, and finished off at top with two $2\frac{1}{4}$ in. chamfered blue Staffordshire brick splays.

Tablets. Put three 18 in. × 9 in. × 6 in. rubbed Portland stone tablets, built into the piers in cement, marked in sunk Roman letters, "THIS WALL IS THE PROPERTY OF THE GRANGE" (or other property).

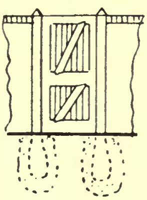
Gate. Form a gateway in walling, with a 9 in. × 3 in. tooled York threshold, and two $4\frac{1}{2}$ in. × 3 in. wrought deal (or oak), rebated, once beaded and chamfered (or neither) door-posts, slightly weathered at top with cast-iron shoes dowelled into stone; and $1\frac{1}{2}$ in. × $\frac{1}{4}$ in wrought-iron ties 18 in. long, ends turned up and down, and built into walls and screwed to posts every 2 ft. apart; and an 1 in. diameter bar iron segmental head piece, with ends flattened and carried 18 in. down door-posts and screwed with four screws to each post. Hang on 4 in. wrought butts (or 18 in. cross-garnet hinges) an $1\frac{1}{2}$ in. (or $1\frac{1}{4}$ in.) wrought deal, ledged, braced and framed door 3 ft. wide, covered with 1 in. (or $\frac{3}{4}$ in.) matched boarding (or V-jointed boarding) and supplied with a Norfolk thumb-latch, a padlock and two keys.



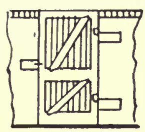


The iron bar head piece is not absolutely necessary when the gate-posts are secured into the walls with the iron ties.

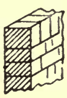
When oak posts some 6 in. square are used, the brickwork is not necessarily revealed out to receive them, they being buried in the ground some two or three feet, the butt ends being charred (or tarred) and surrounded with concrete, and the heads splayed off to an apex. An oak fillet about 2 in. (or $1\frac{1}{2}$ in.) × 1 in. is spiked on to the posts to form the gate rebate. The iron ties and gate head may either be used or not.

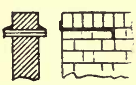


Gates may also be fixed without posts, by simply forming a rebate in the brickwork to receive them; the hinges in this case have to be either pivot or cup and ball hinges, the jaws being buried in the brickwork on stone "hinge stones" and the lock fixing in the same way into a "lock stone."



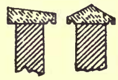
A plinth is not always put to this class of boundary walling. It is better to put a damp course, although not always done, as it keeps the wall dry, and is useful in the case of outbuildings being erected at a future date and butting against it.

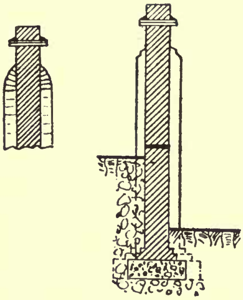




The coping may be simply brick on edge in cement, or brick on edge with a double course of plain tile creasing in cement, and cement weather fillets. In either of these two cases, state that the angles and ends of the walling are to have wrought-iron ties 18 in. long, with ends turned up and down 3 in., and built in so as to keep the end bricks of coping from falling off. Parapet walls to buildings may be coped in a similar manner.

Walls may also be coped in stone, the width and thickness depending upon the thickness of the walls. See Mason, clause No. 49.

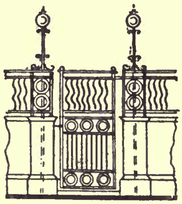




Piers may also be "tumbled in" towards the top, instead of using chamfered bricks. When a garden wall is higher upon one side than the other, the lower part may be built in cement, and loose stones (or rubble) some 9 in. to 12 in. thick, filled in up to the level of the higher ground line, as also under the concrete bed; this will allow water to find its way to the lower ground without bursting out the wall. See notes on retaining walls preceding clause No. 109, for weeping drains to walls.

Front garden and boundary dwarf walls and gates.

(99)—Describe, as in clause No. 98, the excavating, concrete, damp course, brickwork, piers, plinth and coping, and continue on thus:—



Run an ornamental wrought (or cast) iron railing 18 in. (or other) high along the top, of the p.c. value of (say) 15s. per yard run, the feet being leaded into the coping.

Put two ornamental gas standards and lamps p.c. (say) £3 each, and lay on $\frac{1}{2}$ in. gas tubing to each pier in 1 in. rough deal tarred trough filled with pitch, and continue pipes up to lamps.

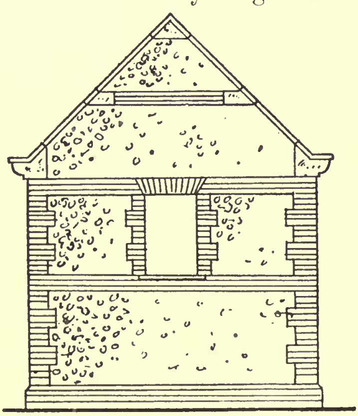
Allow p.c. (say) £5 for a wrought (or cast) iron gate and hinges, with copper ward three-bolt lock; the lower hinge being fixed into an 18 in. × 4 in. rubbed York threshold.

The coping should more properly be in stone for a wall of this description; the plinth also may be in stone, see Mason, clause No. 49, with notes.

Flint Rubble Work.

(Clauses Nos. 100 to 107.)

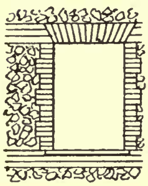
Flint masonry weighs about 148 lbs. per cubic foot.



Buildings may be constructed either with solid flint or solid boulder walls, and require to be of some considerable thickness to support the floors above.

It is better to build the walls with a backing of brickwork, and then face the outside in flints or boulders. In both cases all angles and openings must have brick (or stone) quoins; and brick (or stone) bands (lacing courses) are required every now and then to assist in binding the walls together. The facings may be formed of boulders or knapped boulders, built either random or in rough parallel courses; or with flints built in random courses. Chimney stacks are built in solid brickwork, unless they be made large enough to allow for flint or boulder facings.

Solid flint walls to buildings.

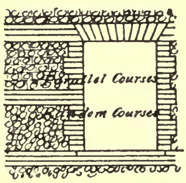


(100)—The walls to be built throughout their entire thickness in random coursed flints, 2 ft. thick on ground floor and 18 in. thick on the first floor, in lime mortar composed of 2 parts sea sand grit to 1 part hydraulic lime, each course being well flushed up, and the flints showing some 5 in. (6 in., 7 in. or 8 in.) across on face. Sweep out joints, and point up in mortar (or cement). External angles, and the dressings to door and window openings, to be carried out in red brick quoins 14 in. and 9 in. wide respectively, with cut and gauged red brick arches 12 in. deep; and two (or more) red brick bands (lacing courses) 6 in. (or 9 in.) deep to be carried round and built the full thickness of all the walls, and weather joint pointed in mortar (or cement). Internal brickwork to quoins and bands may be in a good common brick.

Quoins and dressings may be in any other kind of brick or in stone. State if a brick or stone plinth is required, and whether the walls are to be faced with "white flints," and if cement tuck pointed. Flint walls are seldom built in parallel courses, the flints being so irregular in shape.

If pit sand be used, gauge it with lime and cement. Ordinary flints have in parts a yellowish deposit on them, "white flints" a whitish chalky deposit, to obtain the latter it requires some selection. The difference in colour is caused by the stratum from which they are obtained. Describe the chimney stacks, parapets and other brick or stonework, see Bricklayer and Mason generally.

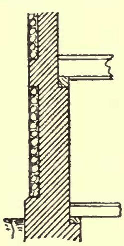
Solid boulder walls to buildings.



(101)—The description of walls, dressings and pointing would remain exactly the same as clause No. 100; but boulders may be built either random or in parallel courses. Give the size of boulders to show on face, as 2 in., 3 in., 4 in. or 5 in.

Boulders are flints picked up from the sea shore, and owing to the action of the water are rounder and less irregular than flints taken from the land. Knapped boulders are never used in solid boulder work. Boulder walls are generally built in parallel courses, and tuck pointed in cement.

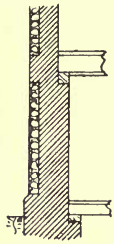
Flint-faced walls to buildings.



(102)—Describe the brick backing 9 in. or 14 in. thick. Face the walls externally 6 in. thick with flints built random, in lime mortar composed of 2 parts sea sand grit to 1 part hydraulic lime, the flints showing some 6 in. (5 in., 7 in. or 8 in.) across on face, sweep out joints and point up in mortar (or cement).

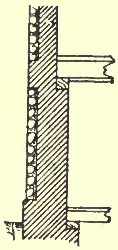
Then describe the brick or stone quoins, the dressings, arches and bands, as in solid flint walling, see clause No. 100; state if faced in "white flints" or tuck pointed.

Boulder-faced walls to buildings.



(103)—The description for the backings, facings and dressings would be the same as to flint-faced walls, see clause No. 102; but state if built random or in parallel courses, with the class of pointing, and the size the boulders are to show on face.

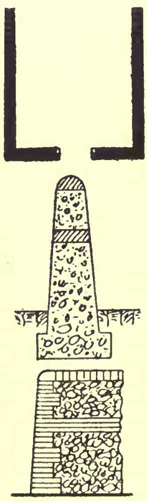
Knapped boulder-faced walls to buildings



(104)—The description would be the same as in boulder-faced walls, see clause No. 103; but state it is to be "knapped boulder work." Give the class of pointing, and the size the boulders are to show on face.

Knapped boulder work is generally built random. Knapped boulders are boulders split in half, and would show on the face from 3 in. to 8 in. across; the flat side being placed to the weather.

Flint boundary walling.



(105)—Excavate ground to extent shown upon drawings, and roughly level up to receive walling, part fill in and ram, and spread surplus earth.

Build the boundary walling round the property, on a footing course of large flints 12 in. deep, 18 in. wide, and carried up 5 ft. above ground line with a 14 in. base at the foot tapered off to 9 in. at the top, built random in lime mortar composed of 2 parts sea sand grit to 1 part of hydraulic lime, the flints showing some 5 in. across on face. Sweep out joints and point up in mortar (or cement). Cope the top with red brick semicircular coping bricks 9 in. wide in cement mortar, with solid brick angle pieces, and iron holdfasts at ends. Run a red brick band (lacing course) three bricks deep along the whole length of walling the full thickness, two-thirds up from ground level. Finish the angles, gate piers, and extremities of walling, with red brick quoins 14 in. and 9 in. wide respectively, finished a weather joint.

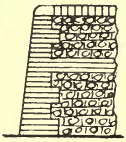
Flint walling is found chiefly in chalk districts, flints being obtained from the chalk; state if built in "white flints," and if tuck pointed. The excavating need only go down as far as the solid chalk.

In thin boundary walling a brick band course adds materially to its strength, but is seldom put in thick boundary walling. The higher the walling the thicker it must be made.

The coping may be brick saddle-back, or plain brick on edge, see clause No. 98.

Describe any gates, see clause No. 98. For other kinds of boundary walling, see clauses Nos. 98, 99, 106 and 107, and Mason, clause No. 109.

Boulder boundary walling.



(106)—Excavate ground to extent shown upon drawings, and roughly level up to receive walling, part fill in and ram, and spread surplus earth. Build the boundary walling round the property, on a footing course of large boulders 12 in. deep, 18 in. wide, and carry up 5 ft. high above ground line with a 14 in. base at the foot tapering off to 9 in. at the top, and built in parallel courses (or random) in lime mortar composed of 2 parts sea sand grit to 1 part hydraulic lime, the boulders showing some 3 in. across on face. Rake (or sweep) out joints, and tuck point in mortar (or cement). Cope the top with red brick semicircular coping bricks 9 in. wide in cement mortar, with solid angle pieces, and iron holdfasts at ends. Run a red brick band (lacing course) three bricks deep along the whole length of walling the full thickness, two-thirds up from ground line. Finish the angles, gate piers and extremities of walling with red brick quoins 14 in. and 9 in. wide respectively, pointed a weather joint.

In this class of walling a band course adds materially to the strength, but is seldom put in thick walling. The higher the walling the thicker must it be made. The pointing need not be tuck pointing. Describe any gates, see clause No. 98. For other kinds of coping, see clause No. 98; and for other kinds of boundary walling, see clauses Nos. 98, 99, 105 and 107, and Mason, clause No. 109.

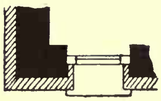
Knapped boulder boundary walling.

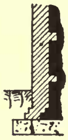
(107)—Knapped boulder walling is built in precisely the same way as boulder walling; and generally in random courses, see clause No. 106; but state the boulders are to be "knapped" with the size they are to show on the face. For gates and copings, see clause No. 98. For other kinds of boundary walling, see clauses Nos. 98, 99, 105 and 106, and Mason, clause No. 109.

Casing in an old building with brickwork.

(108)—Excavate for footings and concrete, part fill in and ram, and part cart away. Lay cement concrete 12 in. deep, 6 in. wider than lowest footing of new work.

Cut out a horizontal course from the old brickwork, half a brick deep every 2 ft. 6 in. apart, and encase all





external walls, chimney stacks and projections in red (or other) facing bricks one (or half a) brick thick, with stock brick backing on footings built in lime (or cement) mortar, finished a weathered joint as the work proceeds, toothed into the old work, and grouted in. The reveals of doors and windows, and any old projections, to be cut away for the new facings.

Then describe the damp course, see clauses Nos. 62 and 63; the air bricks, see clause No. 58; the arches, see clauses Nos. 77 to 81; the dressings, see clauses Nos. 70 to 76; and the hoop iron, see clause No. 66.

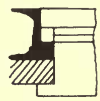
For facing bricks, see Bricklayer, clause No. 68.

Galvanised iron wall ties may be used instead of cutting out the old brickwork and toothing in the new.

The old window sills and door thresholds should be removed, and new ones be put in to the increased width.

All rain-water, soil or other pipes must be altered, lengthened and refixed.

The eaves and guttering to roofs may have to be altered to an increased width; the parapets reformed and recoped in stone or brick on edge; the chimney stacks redressed, with projections, filleting and flaunching to pots; and, in fact, any old work which would be altered or disturbed, must be renewed and made good. The old reveals to doors and windows may be left flush with the new work, without cutting away. The old arches in any case might remain, with the new arches set in front. See Mason, clause No. 106, for ashlar facings to old work.



Retaining Walls.

(Clauses Nos. 109 and 110.)

For campsheeting, see Carpenter, clause No. 340.

Retaining walls are required to resist the pressure of earth or water, and may be in brick, concrete or stone.

The natural slope with a horizontal line of:—

Gravel, is about 40°, and a cubic foot weighs from 112 to 120 lbs.
Shingle, „ 39°, „ „ „ 88 to 105 lbs.
Sand, „ 22° to 38°, and a cub. ft. of pit sand weighs from 95 to 100 lbs.
A cub. ft. of river sand weighs from 102 to 117 or 120 lbs.
„ „ wet sand „ 150 to 170 lbs.
Loose earth, is about 28°, and a cub. ft. weighs from 90 to 125 lbs.
Close earth, „ 50°.
Well drained clay, is about 45°, and a cubic foot weighs 120 lbs.
Wet clay, „ 16°.
Rubble, „ 45°, „ „ „ 140 lbs.
Chalk, „ 80°, „ „ „ 150 lbs.

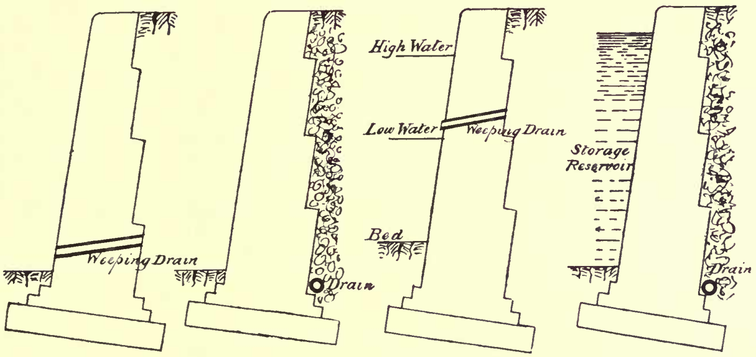
Mud and sludge weigh from 105 to 110 lbs. per cub. ft., and in calculating the pressure, these may be taken to act against a wall in the same way as water.

For weight of brickwork, see notes to clause			No. 3.			
„	concrete,	„	„	No. 40	under	Excavator.
„	stone,	„	„	No. 1	„	Mason.
„	water, see notes preceding clause			No. 21	„	Plumber.

With retaining walls against earth, allow for weeping drains being put from 10 ft. to 40 ft. apart, so that any water at the back of the wall may find its way out, otherwise, unless the wall be built of sufficient strength to resist the pressure of the earth and water combined, the wall will be liable to be thrown over.

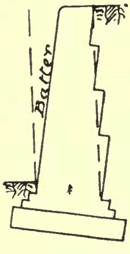
In river and sea walls, these weeping drains should be provided with galvanised iron flap blocks on the water side.

The backs of retaining walls against earth may be filled in with dry rubble, some 12 in. to 18 in. thick, and an open pipe drain taken along the bottom to carry away the water, as with the case of weeping drains the water running down, the walls are liable to be disfigured.



The following are a few rough rules for the thickness at the base of retaining walls against earth.

Practice shows the most suitable batter to be 1 in 6, or 2 in. to the foot; hence the centre of gravity is thrown well back, and it requires great leverage before the wall is thrown over. Walls may also be battered 1 in 4, 5, 8 or 12.

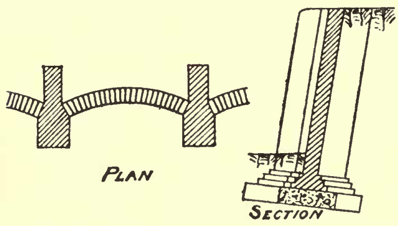


The thickness of the base should be from one-quarter to one-third the height. The thickness at the top being the difference between the thickness at the base and the batter, thus: Take a wall 18 ft. high, the base (at one-quarter the height) would be 4 ft. 6 in. wide, the batter (at 1 in 6), would be 3 ft., hence giving the thickness of wall at top as 18 in.

The back of the walls should be in steps, parallel with, and at right angles to the batter.

The footings should be of sufficient width, that the soil may not be unduly loaded. For safe load on soils see notes preceding clause No. 115.

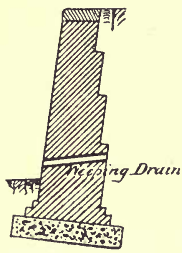
If the foundation be bad, it must either be entirely excavated out and filled in with concrete, or the wall must be built upon piles.

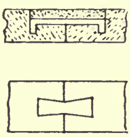


Retaining walls may be built with piers and arches, battered on face.

The rigidity of retaining walls is only as weight for weight. In walls to resist the pressure of water, as in a reservoir, with nothing to counteract the pressure on the other side, the thickness of the base may roughly be taken as three-quarters the height, the thickness at the middle one-half the height, and at the top one-eighth the height.

A brick retaining wall against earth.





(109)—Describe the excavation and filling in at back, see clauses Nos. 9, 10, 12, 16 and 17 under Excavator; and the concrete as clauses Nos. 27, 32 and 35 in Excavator. Describe the brickwork in cement or lime mortar, and state the kind of bricks and pointing, see Bricklayer, clauses Nos. 3, 17 and 68.

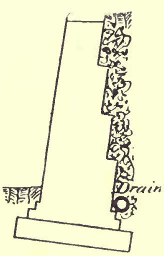
Cope wall with blue Staffordshire bull-nose bricks in cement (state width) laid to a weather.

or,

Cope wall with tooled (or rubbed) weather bull-nose hard York (or other) stone 6 in. (to 9 in.) thick (give width), in lengths of not less than 5 ft., laid and jointed in cement, and cramped with copper cramps 9 in. long, 1 in. wide, $\frac{3}{8}$ in. metal, filled in with cement above (or slate cramps 7 in. × 2 in. × 2 in.).

Leave holes for, and build in after wall has set, 4 in. (3 in. or 6 in.) glazed stoneware pipe weeping drains every 10 ft. apart.

When weeping drains are not required, state:—



Fill in at back of wall the whole height with stone rubble 12 in. (to 18 in.) thick, before filling in the earth. Take a 4 in. (or 6 in.) open-jointed glazed stoneware (or agricultural) pipe drain along the back of wall, and discharge into ditch (or other suitable position), with a galvanised iron movable grid.

It will also be an advantage to put the rubble backing, even when weeping drains are provided.

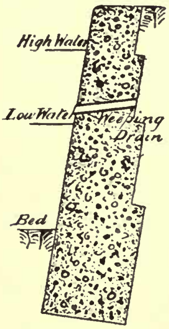
In river or sea walls, state:—

The weeping drains are to have galvanised iron flap blocks on the river or sea face.

If the wall be in concrete, see the following clause, No. 110, and if in stone, see Mason, notes preceding clause No. 104, which give some of the various forms of stone walling.

If land ties be required to brick or stone walling, see clause No. 110.

A concrete river (or sea) wall.



(**110**)—Describe the excavating and filling in at back, see Excavator, clauses Nos. 9, 10, 12, 16 and 17.

The trenches to be pumped dry when laying the concrete.

The concrete wall to be formed between strong timber framings and rough horizontal boarding, wrought on the one side where against the river face of wall. Remove framings and boarding when directed.

Build the wall in cement concrete composed of 1 part Portland cement, 7 (or 6) parts Thames ballast (or other equally good ballast) to pass a $1\frac{1}{4}$ in. diameter ring, and 1 part sand. The concrete to be laid in stepped horizontal courses, not more than 18 in. (or 12 in.) deep at a time, and when set another layer to be formed. The face of the wall showing to the river for 2 in. back to be finished as the work proceeds with fine concrete, composed of 4 parts of fine shingle to pass a $\frac{1}{2}$ in. diameter ring, to 1 part Portland cement, and well incorporated with the other work.

The 2 in. fine concrete face merely gives the wall a clean finish, but a river wall must never be rendered over separately, as it is certain to come off. Also see Excavator, clause No. 35, for heavy concrete work. For a description of Portland cement, sand, ballast and water, see Excavator, clauses Nos. 23 to 26 respectively; and for the method of mixing them together, see Excavator, clauses Nos. 31 and 27.

Building the wall in steps allows it to be bonded together.

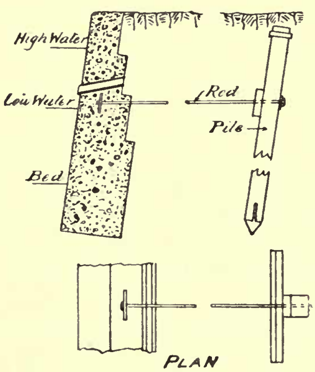
Concrete walls may be the same sizes and sections as brick or stone walls, see notes preceding clause No. 109.

The foundation must be taken down below the river bed to the solid.

Form the top of wall to a weather, with a bull-nose angle. (Brick or stone coping may be used, see clause No. 109.)

Build in after the work has set, 4 in. (or 6 in.) diameter glazed stoneware weeping drains every 20 ft. (30 ft. or 40 ft.) apart, having galvanised iron flap blocks on the river side.

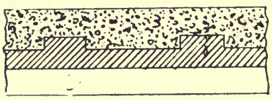
To give additional strength to a retaining wall, land ties may be employed thus:



Place inland, 40 ft. away from the centre of wall and every 30 ft. apart, land ties formed of Baltic fir (or pitch pine) timber piles, 14 in. square and 20 ft. long, driven to a batter of 1 in 12, pointed and shod with cast-iron pointed pile shoes, each having a bearing surface 5 in. square, $8\frac{1}{2}$ in. deep along the central axis, and weighing 28 lbs., and fixed to each pile with four 2 in. $\times$ $\frac{1}{2}$ in. wrought-iron straps 21 in. long, each strap having four $\frac{1}{2}$ in. diameter countersunk holes drilled through, and

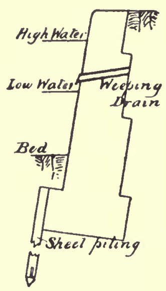
spiked to the piles with wrought-iron spikes 6 in. long. The upper ends of piles to be ringed round with $1\frac{3}{4}$ in. (or 2 in.) × $\frac{1}{2}$ in. (or $\frac{5}{8}$ in.) wrought-iron rings for driving. Each pile to have a 12 in. × 6 in. horizontal cross timber attached, 12 ft. long, with a $1\frac{1}{2}$ in. wrought-iron tie rod passing through the pile and cross timber, and screwed at the end with a nut and washer, with the other end of the rod built into the wall and connected to a $\frac{3}{4}$ in. wrought-iron plate 12 in. square, with a similar screwed end and nut.

If fender piles be required, see Carpenter, clause No. 342.
If piles are to be creosoted, see Carpenter, clause No. 26.
Instead of timber piles, the rods may have plates at both ends, one end being built in the wall, and the land end being built into a block of concrete, 6 ft. × 6 ft. × 6 ft.



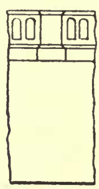
River walls may be built in stone, or faced with stone, or built or faced with blue Staffordshire bricks in cement; the description being somewhat similar to clause No. 109.

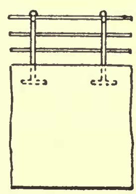
The base of river walls may be protected from being undermined, with 12 in. × 6 in. fir timber sheet piling. State if creosoted, see Carpenter, clause No. 26.



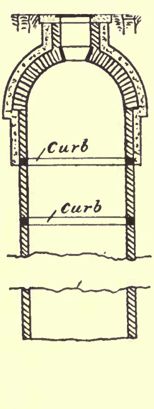
The Thames Conservancy require embankments and river walls as far down as Woolwich Reach to be 5 ft. 6 in. above Trinity high-water mark.

Describe any stone balustrading, or iron railing, sometimes required in certain positions. The feet of the railing standards must be firmly built into the walling.





Fresh-water well supplied from a spring.



(111)—A well supplied from a natural spring has to be "steined" round in brickwork from the top downwards, until the spring is reached, the brickwork in the meantime being supported on timber curbs every few feet apart.

Excavate ground and cart away.

Stein in dry, half (or one) brick thick, a circular drinking water well 5 ft. internal diameter (say) 50 ft. deep from ground line, supported on double rim bolted elm (or alder) curbs, every 8 ft. apart. The first 10 ft. down of brickwork to be built in cement mortar, and lined on the outside with fine cement concrete 4 in. thick. Dome over the top one brick thick in cement mortar, with an iron ring round access hole, and 18 in. diameter manhole cover over, let into a 3 ft. × 3 ft. × 4 in. cut, tooled, hard York stone kerb. Fill in the ground around top.

Allow the p.c. sum of (say) £10 for a pump, and take an $1\frac{1}{2}$ in. (or 2 in.) lead suction pipe down to within 12 in. of bottom of well, stopped at end but pierced 12 in. up.

See Plumber, clause No. 57, for notes on pumps, as also notes preceding clause No. 21 in Plumber.

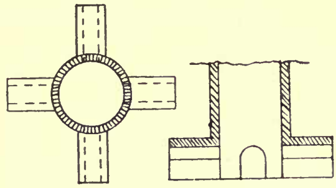
Wells from 2 ft. 3 in. to 6 ft. internal diameters, require half-brick rings; and from 6 ft. 6 in. to 12 ft. diameters one brick rings.

The depth of well varies according to where the spring is tapped.

The top portion being built in cement and surrounded with concrete, prevents any surface water finding its way into the well.

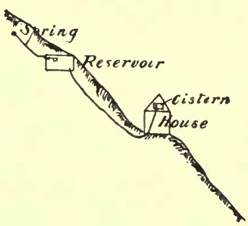
For rain-water wells, see Drainage, clause No. 53, and also see Excavator, clause No. 7.

To obtain a greater amount of storage, headings may be cut at the bottom of the well, and arched over.



Underground fresh-water storage tanks (or reservoirs) to country house supplied from springs.

(112)—In country houses where there is no water company's supply, fresh water storage tanks may be provided both for domestic and fire purposes.



An underground storage tank can only be supplied with fresh water from springs situated at a higher level than the tank itself; and of course the stored water is practically useless for fire purposes unless the tank be placed at a higher level than the top of the building to be protected, so that the necessary pressure may be obtained for the fire hydrants.

For fire hydrants, see Smith, clause 108.

For the same reason the storage cisterns in the house can only be supplied automatically when the storage tank is at a higher level than the house.

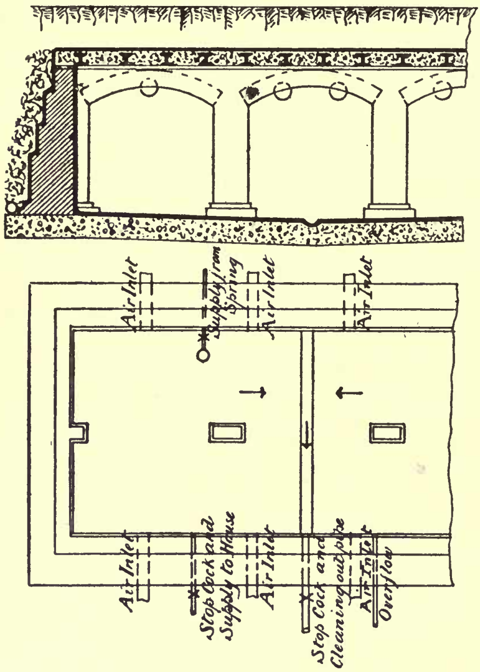
When there is not a spring available at the necessary height to supply the storage tank, water may be thrown up into the tank by a hydraulic ram, see Plumber, clause No. 58.

Storage tanks may be built square, circular, or any other form which may be found necessary owing to the shape of the ground.

The foundations should be in concrete, some 12 in. to 24 in. thick, according to the nature of the soil, and formed as a plateau, upon which the walls of the tanks may be built, and that the water may rest on a firm bed. The walls may be built in cement in ordinary stocks, or blue bricks, or else be formed in concrete. The roof may be arched over in brickwork, or formed with concrete and steel or iron joists.

Here is a description of a brick tank with a concrete roof:—

Excavate ground, part fill in and ram, and part deposit on site (or cart away.



Form a level plateau foundation over the whole area of tank 12 in. wider each way than lowest footing in cement concrete 12 in. thick in two layers, composed of 1 part Portland cement to 6 parts ballast and sand to pass a $1\frac{1}{2}$ in. diameter ring.

Build the walls, piers and arches in stock brickwork, in cement mortar composed of 1 part Portland cement to 2 (or 3) parts sand. Rake out the joints as the work proceeds, and hack the brickwork over on the inside, to form a key for the cement rendering.

Form roof with 8 in. × 4 in. (or other size) steel or rolled iron joists spaced every 2 ft. 6 in. apart, on 9 in. × 3 in. tooled hard York templates running the whole length of walls in lengths of not less than 5 ft. (see Excavator, clause No. 41, for ironwork to concrete floors). Fill in between the joists with cement concrete 12 in. deep composed of 1 part Portland cement to 6 parts ballast to pass a 1 in. diameter ring (coke breeze should not be mixed with concrete where subject to wet) and 1 part sand. Weather off the top from the centre to the sides, to falls of 2 in. in 10 ft., and render over $\frac{3}{4}$ in. thick with 3 parts Portland cement to 1 of sand.

Form access hole to tank in roof with brick in cement (or concrete) sides, and finish with an 18 in. × 24 in. galvanised iron manhole cover, lock and key, with 3 in. × 3 in. × $\frac{1}{4}$ in. T-iron supports, and let into a 3 ft. × 3 ft. 6 in. × 4 in. rubbed, cut and rebated hard York kerb. Put a movable galvanised iron ladder 18 in. wide, reaching to bottom of tank, with eye fixing at top. Spread earth over top of tank (say) 3 ft. deep.

Render the outside of walls $\frac{3}{4}$ in. thick in cement and sand in equal proportions.

Render the inside of walls, arches, soffits, and underside of concrete roof, $\frac{3}{4}$ in. thick with Portland cement and sand in equal proportions, with the angles thickened out; and before it is quite dry, finish with neat Portland cement $\frac{1}{4}$ in. (or $\frac{3}{8}$ in.) thick, trowelled over until all the water is worked up to the face.

Form the floors to falls, with a channel to the cleaning-out pipe, in fine concrete 2 in. thick, composed of 1 part Portland cement to 4 parts fine shingle (or granite chippings) with the angles thickened out, and finish with neat Portland cement $\frac{3}{8}$ in. thick, in the same way as to the walls.

Fill in at the back of walls with rubble stone 12 in. (or 18 in.) thick, and put a 4 in. glazed stoneware open-jointed (or agricultural) pipe drain beneath, taken round to the lowest point and discharging into the ditch near (or other position), with iron grid at end.

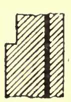
Put 9 in. glazed stoneware air pipes every 10 ft. apart on two sides at top of tank, with bends, and finish off with fine perforated galvanised iron gratings.

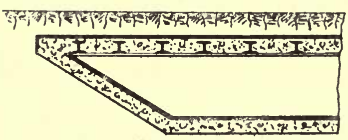
Tap spring on hill, and bring down 1 in. galvanised iron tubing to tank, and finish with 1 in. ball-cock, copper ball and stem, and one full-way brass stop-cock. Take a 2 in. galvanised iron overflow pipe, and discharge out into the open, with brass flap on end. Take from tank, about 6 in. above bottom, with large pierced movable rose cap outlet, an 1 in. (or $1\frac{1}{4}$ in.) galvanised iron service pipe to cistern in house as rising main, with a full-way stop-cock in small iron chamber just outside tank.

Take a 3 in. cast-iron cleaning-out pipe, leaded at joints, and with a screw-down valve in a small chamber near tank with iron cover, and carry the pipe into ditch near with a galvanised iron rose on end.

See notes on retaining walls to clauses Nos. 109 and 110 for thickness of walls; and note that the walls must be made sufficiently strong to resist the greater pressure, whether of the water or of the soil.

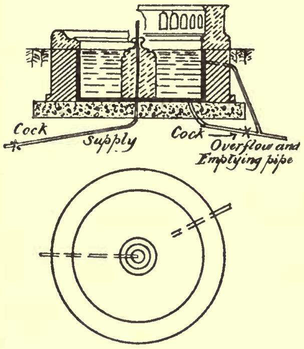
Storage tanks should be sufficiently large for a 16 weeks' supply. For concrete walls, see clause No. 110, and clause No. 47 under Excavator. The outside may be puddled round in clay, some 9 in. to 12 in. thick, instead of cementing over. Instead of the cement rendering the inside may have a separate half-brick lining in enamelled brickwork in neat cement, and grouted in neat cement between the lining and the walls some $\frac{3}{4}$ in. or 1 in. thick. The inside may also be lined round with mastic asphalt $\frac{3}{4}$ in. or 1 in. thick, with a fillet at angles, instead of the cement rendering; the joints of the brickwork being raked out as the work proceeds, and the brickwork roughed over to form a key. When the sides take the natural slope of the soil, the bottom and sides of a tank may be formed in concrete about 12 in. thick (and lined in cement). A storage tank must be cleaned out periodically. For a rain-water storage well or tank, see Drainage, clause No. 53.





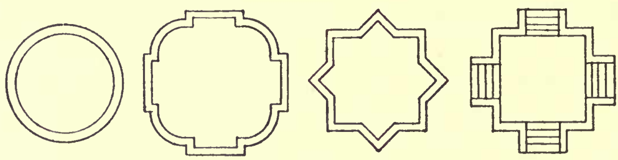
A concrete or brick reservoir will not hold water unless it be finished on the inside in neat cement, except it be in enamelled bricks with neat cement joints.

Fountain and tank.



(**113**)—The bed walls and cement lining to a fountain tank would be formed in somewhat a similar way to that of a reservoir, see clause No. 112. Then describe the moulded stone kerb, or balustrading round, with the stone centre ornament, and any steps down to the water, with the sizes of the various parts. The supply pipe may be $\frac{3}{4}$ in. or 1 in., in galvanised iron for small garden fountains, with stop-cock to control it, and gun-metal nozzle jet at outgo. The height to which a fountain will play is governed by the pressure or height above of the water supplying it. Describe, say a 3-in. overflow pipe, and a 2-in. (or 3-in.) cleaning-out pipe with stop-cock, and continue the pipe on into a ditch near, with grid at end, in somewhat a similar manner as to the overflow and cleaning-out pipe of a cistern, see Plumber, clause No. 30.

A concrete or brick tank will not hold water unless the inside be finished in neat cement, in the same way as to a reservoir, see clause



No. 112. The plan of a fountain tank may be of various designs, and should not be very deep, unless protected with a balustrading round. To keep the water fresh it must be constantly changed.

Filter.

Distillation is the only absolute way of purifying water. Boiling will practically purify water, but causes it to taste flat, and there is one species of bacteria which it does not kill; and in some waters certain chemicals are found which boiling will not dissolve. Boiled water may be filtered to render it more palatable. Hard water is made softer by boiling.

To filter water on a large scale, first collect the water into a settling reservoir, where the bulky substances may subside; then filter through beds of sand and gravel, with a pipe below from which the filtered water may be drawn off. Not more than 2 ft. depth of water should be filtered at a time, or from 70 to 75 gallons to each square foot in area per twenty-four hours.

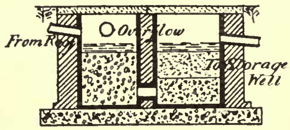
In country districts where there is no public water supply, the rain water from the roofs may be collected and filtered for drinking purposes.

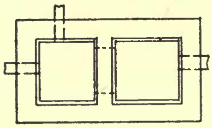
In estimating the quantity of rain water falling on a roof, take the flat area of the roof (and not the slopes) and allow 16 in. in depth, as the average available rainfall per annum.

As rain water attacks lead, the cistern and pipes should not be made of this metal when the water is required for drinking purposes. See Drainage, notes to clause No. 53, for amount of storage supply required in country districts.

Small rain-water filter for drinking purposes to a country house.

(114)—Build filter with brick in cement on footings, and cement concrete, with a centre division having a perforation kept 2 in. above the bottom of filter. Render the whole of the inside in cement and sand $\frac{3}{4}$ in. thick, in equal proportions, and finish in neat Portland cement $\frac{1}{4}$ in. thick. Cover the top over with a 3 in. tooled (or rubbed) hard York stone in two pieces jointed and bedded in mortar. Connect the rain-water pipes from roof into one end of filter, with a 4 in. stoneware pipe, and take a similar stoneware outgo pipe at opposite end, but at a lower level, and connect to storage well (or storage cistern). Fill up the intake chamber of filter to within 3 in. of under side of inlet, with coarse gravel to pass a $\frac{3}{4}$ in. ring; and the other chamber half-way up, with gravel to pass a $\frac{1}{2}$ in. ring; the remainder, to within 3 in. of the under side of outgo pipe, being filled in with gravel and sand to pass an $\frac{1}{8}$ in. ring. Take a 4 in. overflow pipe and discharge into the open.





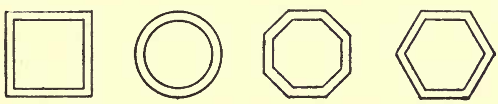
The filter should be cleaned out at least every three months, and fresh clean filtering material put in. For a small eight-room house, the size of the chambers may be each 18 in. square by 15 in. to 18 in. deep below outgo. For a twelve-room house, the chambers may be about 2 ft. square by 18 in. to 24 in. deep. A draw-off cock to the filter may be found useful for emptying.

For a storage well, see Drainage, clause No. 53; and for a storage reservoir, see Bricklayer, clause No. 112.

In larger filters, the filtering material at the top of the intake chamber may be of gravel to pass an $1\frac{1}{2}$ in. ring for half the depth down, then to pass an 1 in. ring for the remainder; and in the outgo chamber the gravel at the bottom to pass an $1\frac{1}{4}$ in. ring for half the height up, and then with gravel to pass a $\frac{1}{2}$ in. ring for a quarter more, and fine shingle and sand to pass a $\frac{1}{4}$ in. ring for the remainder.

Tall Chimney Shafts.

Tall chimney shafts may be on plan in the shape of a square, circle, octagon or hexagon.



A square shaft offers the most resistance to the wind.
A circular shaft offers one-half that of the square.
An octagonal shaft offers three-fifths that of the square.
A hexagonal shaft offers three-quarters that of the square.

The diameter at the base of a square shaft should be one-tenth the height.

The diameter at the base of a circular shaft should be one-twelfth the height.

The diameter at the base of an octagonal or hexagonal shaft should be one-eleventh the height.

The shaft should batter or taper 0·25 or 0·3 in. to the foot (or about $2\frac{1}{2}$ in. in 10 ft., or 1 in 48).

The diameter at the top may be one-fifth to one-third less than that at the base.

The thickness of brickwork to a shaft may be :—

1 brick for the first 20 ft. to 25 ft. down from the top.
$1\frac{1}{2}$ „ for the next 25 ft. to 30 ft. below.
2 bricks for a further 30 ft. below.
$2\frac{1}{2}$ „ „ 30 ft. „

If the diameter at the top exceeds 4 ft. 6 in., the brickwork should be $1\frac{1}{2}$ brick thick for the first 25 ft. down. Roughly, it may be taken that after 50 ft. down from the top, the shaft should have half a brick additional thickness for each 25 ft. below.

The London Building Act requires that a tall chimney shaft shall be 1 brick thick for the first 20 ft. down from the top, with half a brick additional thickness for each 20 ft. below; and that the base, if square, should be one-tenth the height; if circular or other shape, one-twelfth the height; and the taper (batter) towards the top $2\frac{1}{2}$ in. in 10 ft.

Tall chimney shafts should stand clear of any buildings. The fire-brick lining round the inside at the base must be built quite independently from the shaft. The size of the foundation depends upon the weight of the shaft to be carried by the natural soil; but the larger the foundation the better.

A safe load on a hard rocky foundation may be 9 tons per square foot.

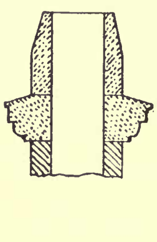
A safe load on a fairly hard rocky foundation may be 3 tons per square foot.

A safe load on a soft rocky foundation may be 1·8 tons per square foot.

Firm earth, hard clay, gravel and sand, may be loaded from 1 to $1\frac{1}{2}$ tons per square foot. The word "rock" is a term applied to all earths.

The shaft itself will bear a safe load of 4 to 6 tons per square foot of sectional area, if built in good stock bricks.

The blocking at the top of shaft may be finished in iron, brick, stone or terra-cotta, and should slant upwards; and any projection must not overhang much as it offers a resistance to the wind. A projection in any case should balance itself.

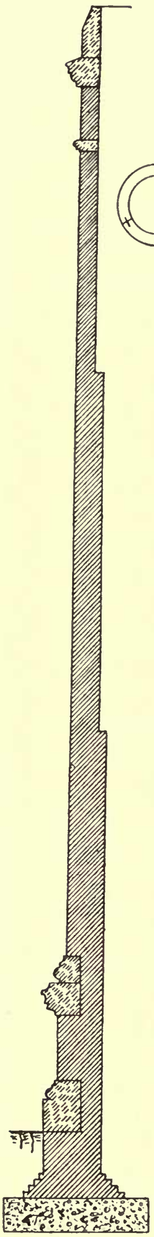


The shaft should be built in lime mortar, with all headers or radial bricks, if circular; other shapes may have three or four courses of stretchers to one course of headers. Stone shafts and cement mortar are both affected by fire, and therefore unsuitable.

Here is a description :—

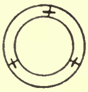
Tall chimney shaft circular on plan.

(115)—Describe the excavation and filling in, see Excavator, clauses Nos. 9, 10, 12, 16 and 17; and the



cement concrete, as in Excavator, clauses Nos. 27, 32 and 35.

Build the shaft in all headers with stock bricks, in lime mortar composed of 1 part well slaked grey lime, 2 parts sand, and $\frac{1}{3}$ part smith's ashes; flush up joints, weather-joint point the outside, and flat-joint point the inside, as the work proceeds. Build in one row of $1\frac{1}{4}$ in. $\times \frac{1}{16}$ in. galvanised hoop-iron bond to each half brick thickness every 3 ft. up.

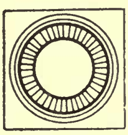


Form the cap in three stones, in 15 in. × 9 in. splayed tooled hard York stone set in cement, cramped at joints with slate (or copper) cramps and cement plugs. Build the cornice in brickwork (or stone) in cement, and weathered off on the top in cement (or weathered only if in stone).

The plinth or base moulding to be in tooled (or rubbed) hard York stone (state size) in cement.

Line the inside of shaft (say) 20 ft. up with fire-brick lining half a brick (or one brick) thick, set in fire-clay.

Affix to shaft a lightning conductor, formed of 1 in. $\times \frac{1}{8}$ in. solid copper tape in one continuous length, without joints, and insulated, and secured with copper eyes 3 ft. apart, so as to firmly hold but not to pinch the tape. Finish the upper end of tape with a band of copper carried round the cap of shaft, and terminate with stout sharp copper points 12 in. long, spaced at intervals of 2 ft. (or 3 ft.) apart. Encase the lower end of tape for 8 ft. (to 10 ft.) above ground line and for 4 ft. (to 6 ft.) below in a painted galvanised iron pipe, and continue on for some 10 ft. (to 15 ft.) away from the stack, and finish with a 3 ft. × 3 ft. $\times \frac{1}{8}$ in. copper plate buried in a bed of moist powdered coke 3 ft. × 5 ft. × 6 ft. (An arch of copper may be placed over the top of shaft instead of the copper points.)



PLAN.

If the foundation be bad for a great depth, the shaft is sometimes built upon piles, see Carpenter, clause No. 341. See clause No. 47 for small boiler shafts.

See notes preceding and following clause No. 2 in Coppersmith, with reference to lightning conductors.

Slate weathering.

(116)—A slate weathering may be put to a set-back on the outer face of a wall, see Mason, clause No. 50.

(117)—

(118)—

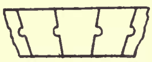
(119)—

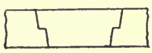
Terra-cotta facing to brick building.

(120)—The terra-cotta to be perforated, chambered, and grooved for flashings, and with all sinkings and projections for binding together, and to be free from cracks, casts or twists, to come out sharp, and to be equal in colour, shape and texture to samples to be deposited with and approved of by the Architect after having been made to previously approved models.

The solid parts of the blocks to be not less than 2 in. thick, and the hollows to be filled up with concrete composed of 1 part of Portland cement to 6 parts of ballast to pass a $\frac{1}{2}$ in. ring mixed with a little sand. The blocks to be soaked in water for at least two hours before fixing, and the brickwork around to be wetted to receive them, and no chipping, filing or rubbing is to be done on any exposed faces, and the blocks are to be so marked that they may be fixed in position with facility. The Architect's full size details and the figures given show the exact sizes of the blocks when fixed.

Face the building with yellow (or red) tinted terra-cotta ashlar blocks 6 in. thick to the sizes shown (or $4\frac{1}{2}$ and 9 in. thick alternately) with one bonder block going through the entire thickness of the walls to every square yard, set in lime mortar with $\frac{3}{16}$ in. (or $\frac{1}{4}$ in.) joints and weather-joint point as the work proceeds (or point up in blue mortar).





Windows and doors to have moulded enriched reveals, mullions, jambs and heads, and the heads to be joggled together. (Then describe any sills, cornices, strings or other dressings to all parts.)

Put 3 in. × 1 in. × 1 in. slate dowels to mullions and 10 in. × $1\frac{1}{4}$ in. × $\frac{3}{8}$ in. copper cramps to copings and run in with cement. Wash and clean off at completion.

Mullions, arches and sills are better set in cement. For lime and cement mortar see Bricklayer, clauses Nos. 9, 10 and 12 to 14 respectively.

The larger blocks of terra-cotta are formed hollow with cross divisions for strength. The hollows or chambers may be filled in with Roman cement concrete or breeze and Portland cement concrete.

Terra-cotta is often let separately to a terra-cotta manufacturer, either to supply and fix himself, or to supply only for the Builder to fix. Or the Builder may be responsible both for the making and the fixing, he being required to procure the terra-cotta from a selected manufacturer. When it is let to the manufacturer to supply and fix he should be bound to certain conditions, such as to deliver in lots by specified dates, to fix by other dates, and to make good any damaged work. In this case, the Builder should be required to assist the manufacturer in his work and to allow him the use of his scaffolding; see Preliminary Items, clauses Nos. 8 to 11, 17, 18, 25, 26, 36, 37, 40 and 50, which with requisite modification would generally apply.

Faience facing to brick building.

(121)—Faience is made in blocks similar to terra-cotta, and fixed in the same way. The surface resembles the enamelled face on glazed brickwork, and may be obtained in many tints. The description would be similar to clause No. 120.

MASON.

For the thickness of stone walls, see Bricklayer, notes to clause No. 17.

For Slate Mason, see Slater, commencing at clause No. 15.

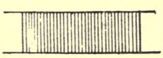
Stone generally.

(1)—The stone to be obtained from the best quarries, and the most durable bed of its class, free from vents, beds, sand holes, red streaks, and all other imperfections; and set on its natural or quarry bed in fine mortar (or cement) after wetting. Each stone to hold its full size, sawn (or drafted) square to the back, jointed, and where required back jointed, and finished with a finely rubbed (or dragged) face when not described as rough or tooled. Point and clean down at completion. Cornices with undercut mouldings built with stratified stone, to be laid with the bed vertical.

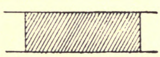
Moderately hard stones, such as Portland or York, are "rubbed" to produce a fine face.

Softer stones, such as Bath, are "dragged" to produce a fine face.

A rough but fairly even face on hard stones is obtained by tooling.



Boasted work is tooling at an angle. Stone sawn square at the back is obtained by sawing. Stone drafted square at the back is worked roughly square with a tool.



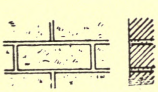
Granite weighs from	163	to	187	lbs.	per cub.	foot.
York stone ,,	156	,,	157	,,		,,
Portland stone ,,	145	,,	151	,,		,,
Bath ,,			123	,,		,,
Mansfield ,, ,,	147	,,	149	,,		,,
Flint masonry	about		148	,,		,,
Rubble stone	,,		140	,,		,,
Artificial stone	,,		144	,,		,,

Granite will take a safe load of	65	tons	per super.	ft.
Portland stone ,, ,,	26	,,		,,
Bath ,, ,, ,,	8	,,		,,
Rubble masonry ,, ,,	2	,,		,,

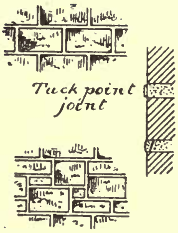
The safe load on stone pillars should not exceed one-tenth to one-eighth the breaking weight. Stone pillars should not exceed in height twelve times their least thickness.

Joints and pointing.

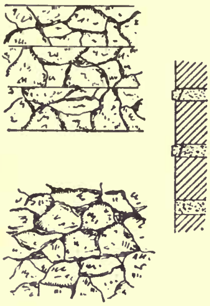
(2)—The joints generally to be where shown upon the drawings.



Joints to "ashlar" work to be $\frac{1}{8}$ in. (to $\frac{1}{10}$ in.) thick, set in lime (or white lead) putty for $\frac{3}{4}$ in. back from the front edge, and neatly pointed up as the work proceeds.



Joints to coursed and uncoursed squared rubble masonry to be $\frac{1}{4}$ in. (to $\frac{3}{16}$ in.) thick, raked out and pointed up afterwards in blue ash (cement or lime) mortar (or filled up in cement and tuck pointed in lime mortar).



"Coursed random rubble," and "uncoursed random rubble" joints, to be raked out, filled up in cement, and tuck joint pointed in cement. (In poorer class work the joints are not tuck pointed.)

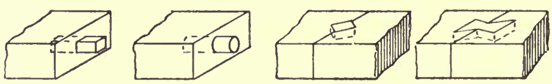
For the various forms of ashlar and rubble masonry, see notes preceding clause No. 104.

Labours and connections.

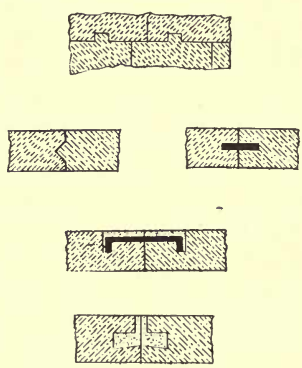
(3)—Perform all mitres, irregular mitres, stopped ends, ends on splay, returned and mitred ends, moulded, rebated, sunk, weathered and throated work, grooves, holes, dishings, joints and requisite jobbing.

Provide all slate and copper dowels, copper and iron cramps, sulphur and lead, and run in.

Dowelled joints may be formed, either with square, round or dove-



tailed holes, secured together with slate or metal dowels of similar shapes.



A joggle joint is similar to a dowel, but worked on the solid stone. It is somewhat weak.

A grooved and tongued joint, sometimes called a joggle joint, is mostly used for jointing landings. A grooved and tongued joint may be formed with a metal tongue let into grooves in the stone.

Cramps are either in galvanised iron, copper or bronze, run in with lead or sulphur.

Lead or cement plugs are formed by filling in the holes with lead or cement. They are much used in arch stones.

Sand. (4)—See Bricklayer, clause No. 8.

Lime. (5)—See Bricklayer, clauses Nos. 4, 5 and 6.

Cement. (6)—See Excavator, clause No. 23.

Lime mortar. (7)—See Bricklayer, clause No. 9.

Cement mortar. (8)—See Bricklayer, clause No. 14.

Blue mortar. (9)—See Bricklayer, clause No. 12.

Gauged mortar. (10)—See Bricklayer, clause No. 10.

Selenitic lime mortar. (11)—See Bricklayer, clause No. 13.

Putty. (12)—See Bricklayer, clause No. 15.

Injury to stones. (13)—Any stone which may be injured during the erection of the building is to be removed, and replaced with new at the contractor's expense.

Case up projections. (14)—Case up all projections and mouldings, and protect until completion of work. Leave arrises sharp.

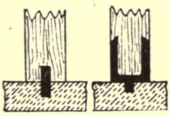
Mouldings. (15)—The mouldings to be worked to true iron (or zinc) moulds (templates).

Carving and Sculpture. (16)—The carving, sculpture and enrichments to caps, mouldings and friezes, to be executed in an artistic manner. All carving, sculpture and enrichments to be set up in the model, and approved by the architect, before being executed in the stone.

Build and bed in stones. (17)—See Bricklayer, clauses Nos. 20 and 21.

Bed sills and thresholds. (18)—See Bricklayer, clause No. 23.

Mortise thresholds. (19)—Mortise thresholds for dowels (or stubs of shoes) of door frames, and run in with cement (or lead).



See Carpenter, clause No. 38, and Smith, clause No. 64.

York stone. (20)—The rubbed York stone to be completed on the premises.

York stone is a sandstone, and most suitable for rough usage. Here are three kinds of York stone:—

"Hard York," suitable for sills, thresholds, copings, pavings, landings, templates, corbels, steps, hearths and street paving.

"Robin Hood York," suitable for better class sills, thresholds, copings, pavings, terraces, stairs, landings and hearths.

"Scotgate Ash York," suitable for heavy work, such as beds of engines and iron columns.

Silex stone. (21)—This is a Yorkshire stone, being very hard, and most suitable for stairs and pavings subject to great wear.

Forest of Dean stone. (22)—To be the blue stone.

This is a sandstone, and is suitable for the same positions as York stone. It much resembles Robin Hood York stone.

Mansfield stone. (23)—This is a sandstone, and is obtained either "red" or "white," and may be used as ashlar and in similar positions.

Red Corsehill stone. (24)—This is a sandstone, and is very similar to Mansfield stone, and suitable for the same positions.

Portland stone. (25)—To be obtained from the "Whitbed" series.

Portland stone is a limestone. That obtained from the Whitbed series is suitable for ashlar, stairs, sills, thresholds, copings, hearths, landings, terraces, and in paving where not subject to great wear. The "true Roach bed" of Portland stone is suitable for engineering work.

Bath stone. (26)—State the quarry.

Bath stone is a limestone. Here are two kinds of Bath stone:—
Corsham Down and Monks Park, both being suitable for ashlar and carving, but not for positions subject to wear, such as pavings and steps. Bath stone may be greatly preserved by coating the faces to the weather with two coats of "fluate" or a similar chemical compound.

Caen stone. (27)—This is a limestone, and is most suitable for fine internal carving.

Kentish rag. (28)—This is a limestone, and is used for ashlar, and paving setts.

Marble. (29)—State the kind, see clauses Nos. 117 to 128. It is a limestone.

Granite. (30)—State the kind, see clauses Nos. 110 to 116.

Used chiefly in engineering works, ashlar, steps, paving setts, and in polished columns and pilasters.

Artificial stone. (31)—See "Road-making," clause No. 7. The better kinds, if suitable, may be used in any position to which York stone is applied.

Yorkshire Stone.

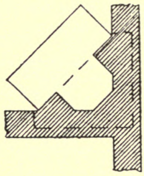
(Clauses Nos. 32 to 74.)

See Clause No. 20, which may perhaps be inserted here.

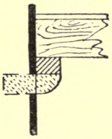
Corbelling. (32)—Corbel out in 3 in. (or 4 in.) tooled "hard York" to chimney breasts on first and second floors; and to other projections (give size of corbels and positions).

See Bricklayer, clause No. 19, for sketch and notes.

Angle and square fireplaces are carried upon corbels when there is no support beneath.



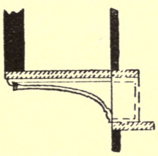
Wall plate corbels.



Corbel out for wall plates, with 6 in. (or 9 in.) × 14 in. × 3 in. (or 4 in.) tooled hard York corbels, every 3 ft. apart, rounded one edge.

For iron corbels, see Smith, clause No. 26.

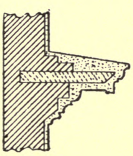
Corbel to bay.



The projecting bay window on first floor to be carried on a 4 in. tooled hard York landing, 8 ft. × 5 ft. in one piece, cut and pinned into wall in cement.

Give the correct position and size of landing.
Describe the brackets, see Smith, clause No. 35.
When a landing is in two or more pieces, state it is to be jointed together, with a 2 in. × $\frac{1}{4}$ in. (or $\frac{3}{8}$ in.) copper (or bronze) tongue, in a grooved joint in cement. Or it may be grooved and tongued in the stone, see note to clause No. 3.

Core to cornice.



(33)—Block out cornice with a 3 in. (or 4 in.) × 24 in. rough York core, in lengths of not less than 5 ft.

Cores to cornices are mostly used with external cement cornices. The width varies according to the projection of the cornice. See Plasterer, clause No. 70.

Stone covering to dry areas.

(34)—See Bricklayer, clause No. 49.

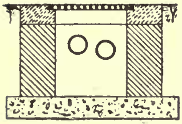
State if tooled (or rubbed) on face and edge. If it is below the ground it may be in rough York or slates.

Stone covering to pipe channels.

(35)—Cover the heating-pipes in ground with $2\frac{1}{2}$ in. rough hard York (give width).

See Bricklayer, clause No. 36, for brickwork and sketch.

Stone kerbs to pipe or other channels.



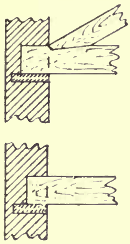
(**36**)—The pipe channels in basement to have 9 in. × 3 in. (or 4 in.) tooled or (rubbed) hard York kerbs, in lengths of not less than 5 ft., rebated for grating, and set and jointed in cement.

For iron grating, see Smith, clause No. 61; and Bricklayer, clause No. 36, for Brickwork.

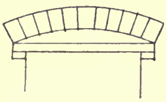
Coal plate kerb.

(**37**)—See Bricklayer, clause No. 61.

Templates.



(**38**)—Bed all tie-beams and purlins to roofs; girders to floors, flats and partitions; girders and bressummers to openings; steel or iron joists to concrete floors; and steel or iron and wood lintels, on tooled hard York templates 3 in. (or 4 in.) thick in cement, with asphalted felt (or 4 lb. lead) seating. Where templates show, they are to be rubbed on face.



Sketch showing templates to lintels.

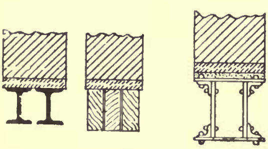
For sizes of templates to tie-beams and purlins to roofs, see Carpenter, clause No. 75. For sizes of templates of girders to floors, see Carpenter, clauses Nos. 53, 55 and 56. For sizes of templates of girders to flats, see Carpenter, clause No. 124. For sizes of templates of girders to partitions, see Carpenter, clause No. 136. For sizes of templates of girders and bressummers to openings, see Smith, clauses Nos. 11 to 14 and 18, and Carpenter, clause No. 44. For sizes of templates of steel or iron joists to concrete floors, see Smith, clause No. 15. For sizes of templates to iron and wood lintels, see Smith, clause No. 17, and Carpenter, clause No. 43.

Templates to piers for pipes.

Bed 2 in. tooled hard York stone templates in cement, on piers to receive heating pipes.

See Bricklayer, clause No. 36, for piers and sketch.

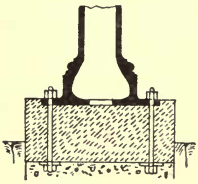
Cover stones.



(**39**)—Put 3 in. ($2\frac{1}{2}$ in. or 4 in.) tooled hard York cover stones in cement, on top of girders and wood bressummers over openings, in lengths of not less than 5 ft., by the full thickness of the wall above, and cramped at joints with 8 in. galvanised iron (or copper) cramps. In riveted girders the rivet heads are to be packed up flush in neat cement to receive the cover stones.

For cover stones to wood bressummers, see Carpenter, clause No. 44. For cover stones to steel and iron girders, see Smith, clause No. 11. For cover stones to riveted steel and iron girders, see Smith, clause No. 11. For cover stones to steel and iron lintels, see Smith, clause No. 17.

Bases to iron columns and engine beds.



(40)—The bases under the iron columns to be in Scotgate Ash York stone, 2 ft. 6 in. × 2 ft. 6 in. × 1 ft. 6 in. (or other size) rubbed on top face and sides, tooled on bed and set in cement on the concrete piers; and drilled for $1\frac{1}{4}$ in. (or $1\frac{1}{8}$ in.) diameter holding down bolts, four to each base. (See Smith, clauses Nos. 36 to 39.)

Stone to engine beds would be of a similar description, but 6 in., 9 in. or 12 in. thick.

Area paving.

(41)—Pave areas with $2\frac{1}{2}$ in. tooled (or rubbed) and jointed hard York stone, laid to falls in straight parallel courses, breaking joint, and bedded in mortar on 4 in. (or 6 in.) cement (or lime) concrete, and jointed up in cement. Each 100 super. ft. is not to be composed of more than 14 stones.

For York paving to footpaths, see "Road-making," clause No. 6 and the notes under clause No. 2.

Robin Hood York paving may be used in the best class work.

If the paving be bedded directly on the ground, then see clause No. 6 under "Road-making."

York paving may also be in 2 in., 3 in., 4 in., 5 in. and 6 in. thicknesses.

Areas may also be laid as in clause No. 42; and see Bricklayer, clause No. 28, for the brickwork.

The work mentioned in clauses Nos. 41 to 45 may also be done in rubbed Portland stone, $1\frac{1}{2}$ in., 2 in., $2\frac{1}{2}$ in. and 3 in. thick, see clause No. 25, and under "Road-making," clause No. 12; and if in Bath stone then 3 in. thick, see clause No. 26, and under "Road-making," clause No. 8.

If in Caithness flagging, see "Road-making," clause No. 9.

If in slate flagging, see "Road-making," clause No. 10.

If in Silex stone paving, see clause No. 21, and under "Road-making," clause No. 13.

If in Forest of Dean stone, see clause No. 22.

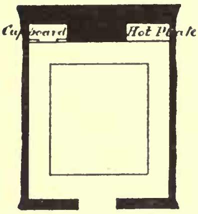
If in artificial stone, see "Road-making," clause No. 7.

Paving to basement, passages and rooms.

(42)—Cover passages, cellars, scullery, kitchen and offices in basement, with $2\frac{1}{2}$ in. (or 3 in.) tooled (or rubbed) and jointed hard York stone, laid in straight parallel courses breaking joint, bedded in mortar on the brick sleeper walls, and jointed up in cement. Not more than fourteen stones are to be laid in every 100 super. feet.

Sleeper walls keep the paving dry; see Bricklayer, clause No. 28, for brickwork and sketch. If laid on concrete bed without sleeper walls, see clause No. 41. Robin Hood York paving may be used in the best class work. For other kinds of stone paving in these positions, see notes to clause No. 41.

Paving as border to kitchen.



(43)—Lay $2\frac{1}{2}$ in. rubbed (or tooled) and jointed hard York stone border, 2 ft. 6 in. (or 3 ft.) wide round kitchen, bedded in mortar, and jointed in cement on the sleeper walls; the paving to be continued under hot plate and cupboard. Not more than fourteen stones to be laid to each 100 super. feet.

See Bricklayer, clauses Nos. 28 and 25, for brickwork to carry paving. Robin Hood York paving may be used in the best class work. For other kinds of stone paving in this position, see notes to clause No. 41.

York stone to a terrace or colonnade.

(44)—Robin Hood stone, either sawn or rubbed, is best in these positions. Describe similar to clause No. 41, but state the size of stones, as in 4 ft., 5 ft. or 5 ft. 6 in. lengths, and in 2 ft. 6 in. or 3 ft. widths.

With paving in these positions, state that the edges are to be chiselled off and rubbed down after the paving has set.

Sawn one side ordinary hard York stone is very suitable, and may be roughly rubbed over when set, with the edges chiselled off and rubbed down.

State if laid on concrete, as clause No. 41; if laid on sleeper walls, as clause No. 42, and Bricklayer, clause No. 28; if laid on the ground, see clause No. 6 under "Road-making."

For other kinds of paving in these positions, see notes to clause No. 41.

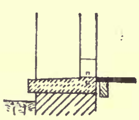
Footpath paving.

(45)—See "Road-making," clause No. 6 and the notes under clause No. 2, and for other kinds of paving see "Road-making," clauses Nos. 7 to 10, 12 to 14, 16 and 17.

Relay old paving.

(46)—See "Road-making," clause No. 15.

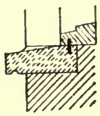
Thresholds.



(47)—Put in one length each, to all external door and cellar openings, 3 in. rubbed (or tooled), weathered and back-jointed hard York thresholds, $1\frac{1}{2}$ in. wider than the full thickness of the walls, and kept $\frac{1}{2}$ in. (to $1\frac{1}{2}$ in.) above floor level, and mortised for dowels (or stubs of door shoes).

In positions subject to heavy weights thresholds should be thicker, say up to 6 in. or 9 in. Thresholds may be in Robin Hood York stone for better work, as also in Portland stone, Caithness stone, and Silex stone. Some artificial stones are very suitable for thresholds.

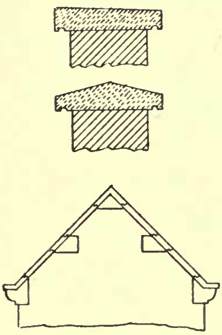
Sills.



(**48**)—Put in one length each, to all windows, 8 in. × 3 in. (or 9 in. × 3 in.), rubbed, sunk, weathered and throated hard York sills, 4 in. longer than openings, with stopped ends, and grooved for $1\frac{1}{8}$ in. × $\frac{1}{8}$ in. iron tongues, and with the stools worked on for mullions and reveals.

If sills are jointed between the openings the weather is sure to find its way in. Sills may be in Robin Hood York, or in other stones as mentioned in clause No. 47, and in such sizes to suit the class of work. See Plasterer, clause No. 73, for external cement sills, and Bricklayer, notes to clause No. 67, for brick sills.

Coping.



(**49**)—Put 13 in. × 3 in. weathered (or saddle-back), twice (or once) throated, hard York coping to all parapet walls, in lengths of not less than 5 ft. each, with returned angle stones; and the whole bedded and jointed in cement and cramped together with copper cramps 9 in. long. Finish the gables with solid apex stones, kneelers and bonders.

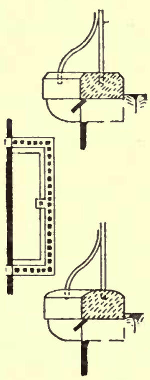
Coping may be in Robin Hood York, or in other stones as mentioned in clause No. 47.

York coping is also cut in 12 in. × 2 in., 12 in. × $2\frac{1}{2}$ in., 12 in. × 3 in. and 18 in. × 3 in. sizes. Practically the coping should project not less than 2 in. on either side of the walling under.

Portland stone coping is cut in 12 in. × $2\frac{1}{2}$ in., 16 in. × $2\frac{1}{2}$ in. and 20 in. × 3 in. sizes, but of course it may be had in any size to suit the work.

For brick coping see Bricklayer, notes to and clause No. 98.

Kerbs to area walls.



(**50**)—Cope area walls in lengths of not less than 5 ft., with 9 in. × 6 in. tooled (or rubbed) hard York stone, chamfered $1\frac{1}{4}$ in. down on two edges (or rounded on top face); bedded and jointed in cement; slate (or copper) dowelled at joints; ends built 6 in. into walls; and mortise holes cut for iron railings. Similar York spurs, projecting out 12 in., to be placed every 10 ft. apart on tooled (or rubbed) rounded York corbels built 9 in. into walls.

Put 4 in. × $\frac{1}{2}$ in. sawn (or rubbed) slate creasing (weathering) under kerb in cement.

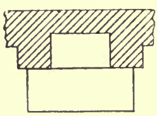
Double tile creasing in cement, with cement filleting, may also be used.

When there is a long length of unsupported railing the spurs are required to support the stiffeners of the legs to the railing standards.

York kerbs may be in Robin Hood stone, and are cut in 5 in. × 6 in., 6 in. × 6 in., 7 in. × 6 in. and 8 in. × 6 in. sizes.

Portland stone kerbs are cut in 6 in. × 6 in., 7 in. × 6 in. and 8 in. × 6 in. sizes, rounded or chamfered on top. For kerbs to pavement lights, see Glazier, clause No. 18. For kerbs to area gratings, see Smith, clause No. 45. When kerbs are bedded flush with the street paving in positions subject to great traffic, ordinary hard stones will not stand the wear; in such cases granite should be used.

Hearths.



(**51**)—Put to all fireplace openings 2½ in. (2 in. or 1½ in.) rubbed hard York front and back hearths in cement; back jointed, and notched to chimney-pieces. The front hearths to be 18 in. longer than the fireplace openings, and 18 in. in width, and bedded in cement concrete. (See Bricklayer, clauses Nos. 25 and 42, for the concrete.)

Hearths may also be in Robin Hood York.

Rubbed Portland stone hearths may be used in the best work, 1½ in., 2 in. and 2½ in. thick.

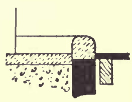
Hearths may be in polished marble, ¾ in., 1 in., 1¼ in. and 1½ in. thick.

State the kind of marble, such as Sicilian, vein, statuary or black, see clause No. 122, and under Pavior, clause No. 6.

For cement hearths, see Pavior, clause No. 5, and Bricklayer, clause No. 42.

For tile and brick hearths, see Pavior, clauses Nos. 6 and 5 respectively.

Kerb fenders to fireplaces.



(**52**)—Put to all fireplaces in basement and kitchen offices, 4 in. × 3 in. rounded rubbed hard York kerbs in cement, slate (or copper) dowelled at joints. The underside to be set 1 in. below the flooring level.

Hearth kerbs may also be in Robin Hood York.

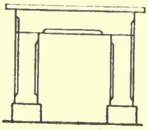
Kerbs may also be in Portland stone or enamelled slate.

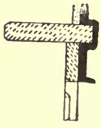
In the best rooms glazed brickware or marble kerbs may be used, see Pavior, clause No. 6, and Mason, clause No. 123, respectively.

Fender kerbs to other floors.

State the kind of material and size, as in this clause No. 52, and describe the positions.

Plain stone chimney jambs.





(**53**)—The kitchen and scullery ranges to have 8 in. × 1½ in. (or 9 in. × 2 in.) stop chamfered rubbed York jambs and friezes with slightly projecting bases, 9 in. × 1½ in. (or 14 in. × 2 in.) twice chamfered rubbed York mantel shelves, pinned and copper cramped into walls, fixed in cement and made good to plastering.

For chimney-pieces to other fireplaces, see clause No. 124; Carpenter, clause No. 215; Smith, clause No. 74; and Slater, clause No. 18.

Channel stones.

(54)—When a channel stone is required to take off the water from paving, it may be described as:—

10 in. × $3\frac{1}{2}$ in. tooled (or rubbed) hard York, in lengths of not less than 5 ft., with a channel sinking 6 in. × $1\frac{1}{2}$ in.

Channelling may also be in Robin Hood York or Portland stone.

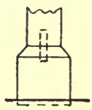
Channel stones are also cut 12 in. × $3\frac{1}{2}$ in. and 14 in. × $3\frac{1}{2}$ in., each having a 6 in. × $1\frac{1}{2}$ in. sinking.

Scullery sinks in stone.

(55)—To be 3 ft. × 2 ft. in rubbed (or tooled) hard York, 6 in. (or 8 in.) thick, rounded corners, $3\frac{1}{2}$ in. (or 5 in.) sinking, hole cut and rebated for waste, and one (or two) edge cut and pinned into wall in cement.

For other kinds of sinks, see clause No. 97; Bricklayer, clauses Nos. 91 and 32; Plumber, clause No. 33; Carpenter, clause No. 288; and Slater, clause No. 21.

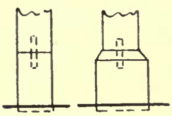
Bases to door frames.



(56)—To be 12 in. deep by $1\frac{1}{4}$ in. wider each way than the door frame, in tooled (or rubbed) hard York, chamfered all round, and mortised for dowels.

See Carpenter, notes to clause No. 38.

Bases to wood posts.

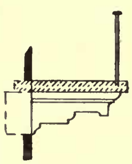


These would be similar, either flush all round with the posts, or slightly larger and chamfered.

Gully stones, manhole stones and other stonework connected with drainage.

(57)—See Drainage, clauses Nos. 26, 30, 33, 37 to 40, 43 to 45, 48, and 50 to 54.

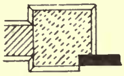
Balcony.



(58)—To be in Portland stone 4 in. (5 in. or 6 in.) thick, rubbed all round, weathered $\frac{1}{2}$ in. on top face, cut and pinned 6 in. into wall in cement, and projecting out 3 ft. (to 4 ft. 6 in.), joggle jointed together in lengths of not less than 5 ft., and supported on cut, moulded and rubbed Portland stone brackets 8 in. wide, 12 in. deep, cut and pinned in cement 18 in. into wall, and placed at 2 ft. 6 in. centres. Form holes for railing.

It may be in York stone or any other hard stone. The brackets may also be in slate or in iron, see Smith, clause No. 35. See notes to clause No. 3 for joggle joints. State if landing is moulded on edge, if brackets are carved. For railing, see Smith, clause No. 47.

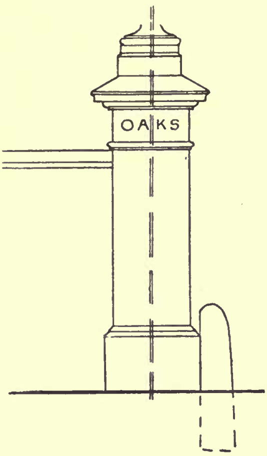
Lock and hinge stones.



(59)—To be in sawn hard York, 6 in. (to 9 in.) deep, the full size of piers, rubbed (or tooled) on the outer faces, sunk for ironwork and rebated for door.

Also see Carpenter, clause No. 266.
Soft stones should never be used in these positions.

Gate piers.



(60)—State the class of stone, if dragged or rubbed (see notes to clause No. 1). Give the sizes of the various parts. The cap should be in a single stone.

If there be a lamp, it may be described with the piers, see Bricklayer, clause No. 99, and state that the piers are drilled through for the tubing.

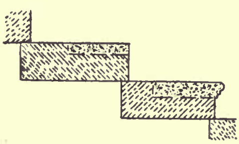
For the spurs and threshold, see Carpenter, clauses Nos. 266 and 269. Describe any incised or raised lettering on piers.

Stonework specially to stables.

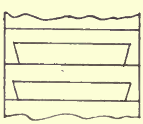
(61)—For thresholds and stone blocks to coach-house doors, see Carpenter, notes to clause No. 270, which may be described with the doors. Also see Carpenter, clause No. 271. For thresholds to the stable doors, see Carpenter, clause No. 272; these should not be raised more than 3 in. above the outside paving, they are better almost flush, otherwise the horses may stumble. For thresholds to loft doors, see thresholds in clause No. 47, to which they would be similar, from 3 in. to 5 in. thick.

Repairs to solid stone steps.

(62)—Sink down over the worn parts of treads $2\frac{1}{2}$ in. (to 3 in.) deep, and piece out with $2\frac{1}{2}$ in. (or 3 in.) rubbed similar stone set in cement, with the nosing moulded to match (or the arris taken off).



or,



Chisel the treads 1 in. down, wedge-shaped at ends, and fill up in neat Portland cement, with the moulding worked on (or the arris taken off).

If the steps be formed with treads and risers similar to notes in clause No. 71, they may either be cemented out as just described, or else pieced out with stone the full thickness of the treads, so long as the piecings out are supported from beneath; otherwise entirely new treads should be put.

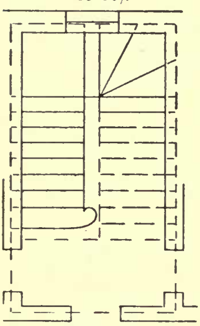
(63)—

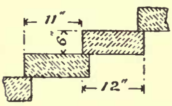
STONE STAIRCASES.

(Clauses Nos. 64 to 74.)

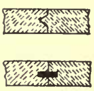
See Carpenter, notes preceding clause No. 217, and notes to clause No. 221 in Carpenter.

Back staircase (clauses Nos. 64 to 66).

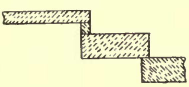




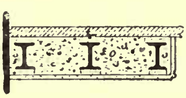
(64)—The back staircase from basement to second floor to be formed with 12 in. × 6 in. rubbed on all sides and one end, solid hard York stone hanging steps, projecting 3 ft. 6 in. out from the walls, with the arris taken off $\frac{1}{4}$ in., and cut and pinned in cement as the work proceeds 6 in. into walls, bedded together in cement, and two holes mortised out on each step for balusters, and at 5 in. apart on landings. The curtail step to be 14 in. × 7 in., with a scroll end, and bedded 1 in. below the floor level. The winders, quarter and half-space landings to be 6 in. thick, cut and pinned 6 in. in cement into walls, the landings being joggled together in cement (or jointed together with a 2 in. × $\frac{1}{4}$ in. bronze, gun-metal or copper tongue, let into grooves in the stones in cement). The thresholds to the door openings on the landings to be $2\frac{1}{2}$ in. (or 3 in.) rubbed hard York, and back jointed.



Sections showing joggled and tongued joints.



Landings are 3 in., 4 in., 5 in., and 6 in. thick, and when employed thinner than the steps themselves they must be made out the necessary depth with a riser piece to the top step. Stone stairs are often built in after the walls are up, in that case, state that holes are to be left in the walls, into which the steps and landings can be pinned. If the half landings cover a large space, the stone landings forming them must be supported at the outer edge on an iron or steel joist. Or the landings may be formed up with iron or steel joists and concrete, see Excavator, clause No. 41, and then covered over with $2\frac{1}{2}$ in. (or 3 in.) rubbed hard York jointed paving, breaking joint, laid and jointed in cement and moulded on the outer edge. The apron linings may be in plaster or boarding.



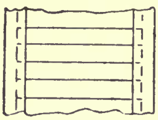
Handrail and balusters.

Put a 3 in. × $2\frac{1}{2}$ in. moulded mahogany continuous handrail, with all wreaths, twists and handrail screws, fitted into wall at top end, finished with a scroll turn at newel end, and rebated out on the under side to receive a $\frac{3}{4}$ in. × $\frac{3}{16}$ in. wrought-iron core screwed in with counter sunk screws, and also screwed to $\frac{3}{4}$ in. wrought-iron square bar balusters, let into mortises in the steps and landings with lead. Each tread to have two balusters, and on the landings to be spaced 5 in. apart. Put a cast-iron ornamental newel to curtail step, p.c. 15s.

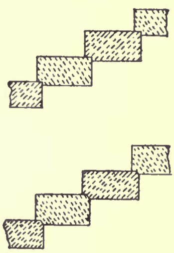
State if iron stiffeners to handrail are required, see Carpenter, notes to clause No. 220. State if a pair of brass stair eyes be provided to each tread, p.c. 6d. to 1s. per pair, and let in with lead.

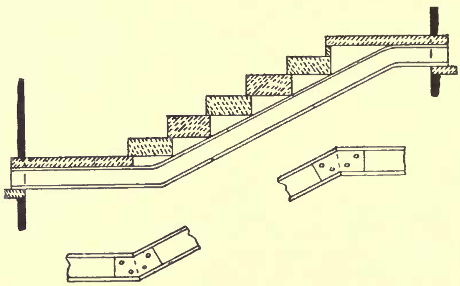
If a handrail is required also on the wall side, describe as clause No. 218 in Carpenter.

These stairs may be in Robin Hood York or Portland stone, and where great traffic, then Silex stone is suitable, see clause No. 21. It is better to build hanging steps 9 in. into walls; but if steps are built in between two walls, then $4\frac{1}{2}$ in. on either side will be sufficient. When steps are too long to be in one stone, they should be dowelled or joggled together, but of course hanging steps can only be in one stone.

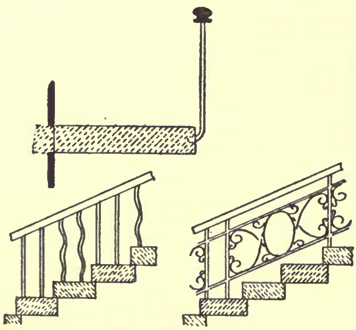


Solid steps may be rebated together or rebated and splayed together; this prevents the stones slipping on their bed.





If hanging steps are required more than about 5 ft. long, they must be supported at the outer end on a rolled iron or steel joist, bent at the angles, and pinned into walls on stone templates. The joists may be mitred together at the angles with fish plates on either side, bolted through; see Smith, clause No. 12.

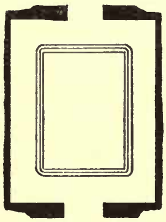


When space is limited, the balusters may be kept outside the steps and mortised into the ends, and run in with lead. Balusters may be in plain or twisted wrought iron, or in ornamental cast or wrought iron.

Halls, landings and passages to stairs.

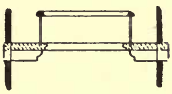
(**65**)—See clause No. 42 and notes to clause No. 64.

Stone gallery.

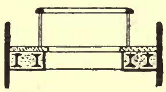


(**66**)—A stone gallery would be constructed in a similar way to a balcony as in clause No. 58; or it may be formed with iron or steel joists and concrete, with stone paving on top, see notes to clause No. 64. State if with circular angles to landing.

Describe the handrail and balusters as clause No. 64. The handrail would be continuous in either case.



Section showing brackets.



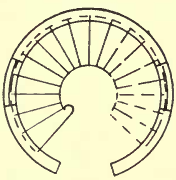
Section showing iron joists.

Principal stairs, passages and gallery.

(**67**)—See clauses Nos. 75 to 77, which may also be in York stone.

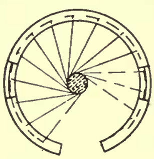
Circular stone staircases with well.

(**68**)—The steps, landings, passages, gallery, handrails and balusters may be described as in clauses Nos. 64 to 66. State that the steps are all winders.



Circular stairs with central newel.

(**69**)—Circular staircases in very limited positions may be described thus:—



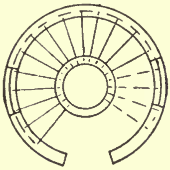
The staircase to be formed of rubbed hard York stone solid winders 6 in. thick, with the arris taken off $\frac{1}{4}$ in., cut and pinned 6 in. into walls in cement as the work proceeds, and bedded together in cement, the centre newel being formed 5 in. (to 9 in.) diameter in the solid out of each step.

The handrail to be 2 in. diameter barrel iron, screwed together with flush joints, with cast-iron bracket supports every 4 ft. apart, screwed to handrail and built into walls. The ends to be turned into wall (or finished with monkey-tail ends).

The landing at the top would have the solid newel piece worked on. Other landings and the passages would be similar, as in clauses Nos. 64 and 65. No balusters would be required.

This form of staircase should not be less in width than 18 in. to 21 in. clear from the newel to the wall. Robin Hood York stone may be used.

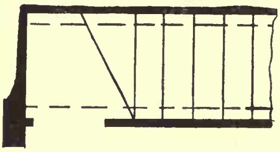
Circular stairs with hollow newel.



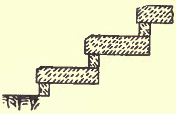
(**70**)—Circular staircases with a hollow newel would be described similar to clauses Nos. 64, 65 and 68. The newel might be in cut and rubbed brickwork (or in tooled or rubbed stone), built in cement. The handrail might be similar to clause No. 69, or as the wall handrail in clause No. 218 under Carpenter.

Ordinary basement stairs to ground floor.

(**71**)—May be similar to clause No. 64, and either tooled or rubbed, and the handrail may be in iron, as clause No. 69.

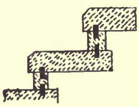


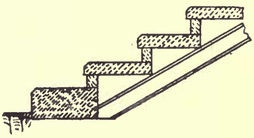
Brick walls may be built under these stairs, instead of pinning the steps into the walls.



Basement stairs may also be formed of 12 in. (or 13 in.) × 3 in. (or $2\frac{1}{2}$ in.) tooled (or rubbed) hard York treads, with the arris taken off $\frac{1}{4}$ in., and built into walls 4 in. on either side, and with 2 in. tooled (or rubbed) risers jointed in cement.

The treads and risers may be dowelled together with four $\frac{1}{2}$ in. diameter copper dowels to each tread.





If this form of staircase be supported from the one wall only, an iron or steel joist may be placed under the outer extremity, see notes to clause No. 64, but the lowermost step should be a solid stone.

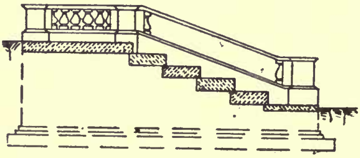
See Smith, clause No. 12, for iron carriage.

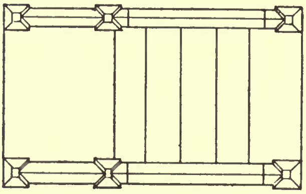
Area steps.

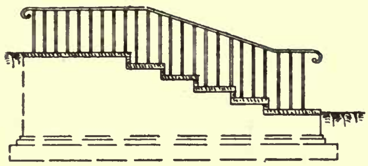
(**72**)—May be solid, as clause No. 71, either tooled or rubbed, or else formed with treads and risers, as in clause No. 71. In either case state that the treads are to be tilted or weathered $\frac{1}{8}$ in. (to $\frac{1}{4}$ in.).

Garden and outside terrace steps and landings.

(**73**)—May be in tooled (or rubbed) solid hard York stone, either as clause No. 64, or formed with treads and risers, as clause No. 71; but state that the steps







(or treads) are to be weathered $\frac{1}{8}$ in. (to $\frac{1}{4}$ in.), and the landings $\frac{1}{8}$ in. (to $\frac{1}{4}$ in.) to the foot. State if with moulded nosings, and if the steps and landings are in one length.

These may also be in Robin Hood York or Portland stone. The brick carriage walls may be described with the steps.

Describe the stone balustrading as clause No. 104; if iron balustrading or railings, then see Smith, clause No. 46, and state that the steps and landings are to be mortised out to receive the balusters.

Steps to front entrance door.

(**74**)—See clause No. 80, with notes.

Portland Stone.

(Clauses Nos. 75 to 103a.)

See clause No. 25 for class of stone.

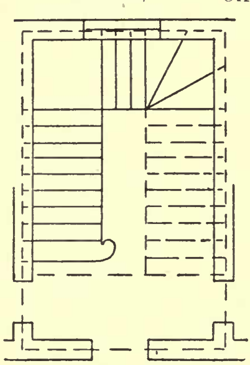
STONE STAIRCASES.

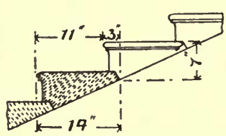
(Clauses Nos. 75 to 80.)

See Carpenter, notes preceding clause No. 217, and notes to clause No. 221 in Carpenter.

Principal staircase. (Clauses Nos. 75 to 77.)

(**75**)—The principal staircase, from ground to second floor, to be formed with 14 in. × 7 in. rubbed on all sides and one end solid Portland stone hanging spandril steps, projecting 4 ft. 6 in. out from walls, with moulded nosings, returned and mitred at ends, rebated, splayed and bedded together in cement, cut and pinned in cement as the work proceeds 9 in. into walls, and two holes mortised out in each step for balusters, and at 5 in. apart on landings.





The curtail step to be 16 in. × 7 in., with a scroll end, bedded 1 in. below floor level.

The winders, quarter and half-space landings to be 7 in. thick, cut and pinned in cement 9 in. into walls, the landings being joggled together in cement (or jointed together with 2 in. × $\frac{1}{4}$ in. bronze, gun-metal or copper tongues let in grooves in the stones in cement.)

The thresholds to door openings on the landings to be $2\frac{1}{2}$ in. (or 3 in.) thick in rubbed Portland stone, and back-jointed.

If the half-space landings cover a large area, they may be treated in the same way as mentioned in the notes to clause No. 64.

Also see the other notes to clause No. 64, which apply equally here.

Then describe the handrail and balusters similar to clause No. 64.

If this class of staircase have a stone balustrade at the outer edge, supported on walls, arches or columns, then describe the balustrade as clause No. 104. See clause No. 64 for stair eyes.

Halls, landings and passages to stairs. (76)—See clause No. 42, and notes to clause No. 64.

Stone gallery. (77)—See clause No. 66.

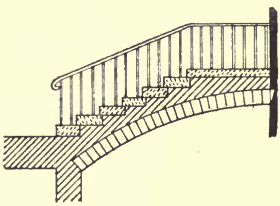
Circular stairs. (78)—See clauses Nos. 68 to 70.

Terrace and outside garden steps. (79)—See clause No. 73.

Front door entrance steps, moulded nosings.

(80)—The three steps to front entrance door to be 16 in. × 7 in., 16 in. × 7 in. and 28 in. × 7 in. respectively in solid rubbed Portland stone, weathered $\frac{1}{4}$ in. on top, worked circular on front face, with moulded nosing on edge, and set in cement on concrete foundations.

A flight of steps to an entrance door may either be solid or formed with treads and risers, the description would be similar to clauses Nos. 64 or 71, and state if the nosings are to be moulded.



The arch carrying the steps may also be described thus:—

Turn arch 9 in. deep in cement over area to receive front entrance steps, and build up solid.

Describe the stone or cement balustrade as clause No. 104, and Plasterer, clause No. 70, respectively; or railings, as Smith, clause No. 46.

Stone tablets. (81)—See Bricklayer, clause No. 98; these may also be in York stone.

The following clauses, Nos. 82 to 103a, may be in Portland stone if desired, the descriptions being similar to York stone, but in every case the stone would be rubbed, except in the case of clause No. 82, when it might be sawn.

Corbels to walls, plates and bays. (82)—See clause No. 32.

Covering to dry areas. (83)—See clause No. 34.

Kerbs to pipe channels. (84)—See clause No. 36.

Area paving. (85)—See clause No. 41.

Paving to passages and rooms. (86)—See clauses Nos. 42 and 43.

Paving to terraces and colonnades. (87)—See clause No. 44.

Street paving. (88)—See clause No. 45.

Relay old paving. (**89**)—See clause No. 46.

Thresholds. (**90**)—See clause No. 47.

Sills. (**91**)—See clause No. 48.

Coping. (**92**)—See clause No. 49; and Bricklayer, notes to and clause No. 98.

Area kerbs. (**93**)—See clause No. 50.

Hearths and kerbs. (**94**)—See clauses Nos. 51 and 52, with notes for the various kinds.

Chimney-pieces. (**95**)—See clause No. 53, with notes for various kinds.

Channel stones. (**96**)—See clause No. 54.

Scullery sinks. (**97**)—See clause No. 55, with notes for various kinds. In Portland stone, sinks are made 6 in., 7 in. and 8 in. thick, with $3\frac{1}{2}$ in., 4 in. and 5 in. sinkings.

Bases to door frames. (**98**)—See clause No. 56.

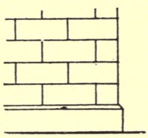
Gully stones. (**99**)—See clause No. 57.

Balcony. (**100**)—See clause No. 58.

Lock and hinge stones. (**101**)—See clause No. 59.

Gate piers. (**102**)—See clause No. 60.

Ashlar.



(**103**)—Portland stone ashlar and dressings would be described similar to Bath stone, but rubbed (not dragged), see clauses Nos. 104 to 107, and notes to clause No. 1.

Repairs to stone steps. (**103a**)—See clause No. 62.

Bath Stone.

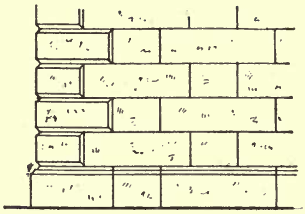
(Clauses Nos. 104 to 107.)

See clause No. 26, which may perhaps be inserted here.

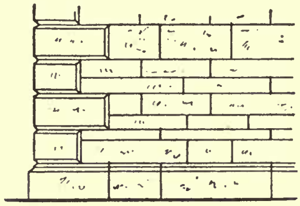
Stone buildings may be built or faced in stone, worked either as "Ashlar" or "Rubble work."

"Ashlar" work is formed with stones worked square and true, and may be built either as "Coursed Ashlar," "Random Ashlar," or "Hammer-dressed Ashlar."

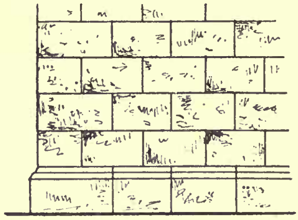
Soft and moderately soft and hard stones, such as Bath and Portland, are suitable for this class of work.



In "Coursed Ashlar" the stones are all the same height, in regular courses. This is the best form of ashlar work.



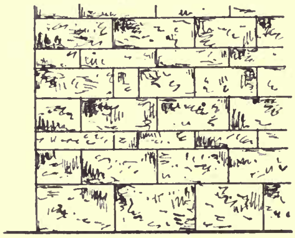
In "Random Ashlar" the stones are all sizes and heights, in irregular courses. This is an inferior form of ashlar.



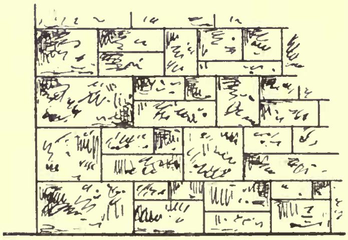
In "Hammer-dressed Ashlar" the beds and joints of the stones are only roughly dressed. It is the roughest form of ashlar, and takes a place between "ashlar proper" and rubble work.

Rubble work is formed with stones rough on face, with the joints and beds either roughly jointed or else unjointed. In coursed rubble work, such as "Regular Coursed Rubble," "Irregular Coursed Rubble" and "Square Uncoursed Rubble," the stones are rough on face and roughly jointed. In random rubble, such as "Coursed Random Rubble" and "Uncoursed Random Rubble," the stones are rough on face and unjointed.

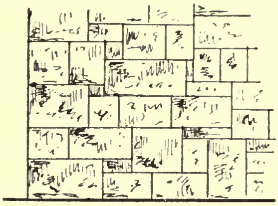
Rubble walling is usually built with the harder class of stones, such as Kentish rag and similar stone.



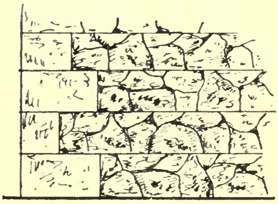
In "Regular Coursed Rubble" the stones are rough on face, roughly squared, and in irregular lengths and heights, but each course is one level height from 4 in. to 8 in. deep. It may also be laid in $1\frac{1}{2}$ in. to 3 in. courses, but when in these sizes generally two or three such courses range together, with a deeper course above and below.



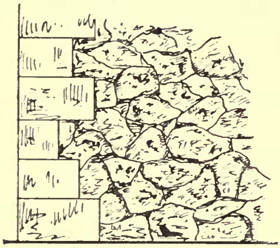
In "Irregular Coursed Rubble" the stones are rough on face, roughly squared, and built in courses 10 in. to 14 in. high, each course consisting of irregular sized stones, either two or three stones deep.



In "Squared Uncoursed Rubble" the stones are rough on face, roughly squared, and built without courses.



In "Coursed Random Rubble" the stones are irregular in shape and rough on face, but built in rough courses 12 in. to 14 in. high. This class of walling is usually built in very hard stones.



In "Uncoursed Random Rubble" the stones are irregular in shape, rough on face, and not built in courses. This is the weakest form of all rubble walling, and is usually built in very hard stones.

Coursed and uncoursed rubble walls should be one-third thicker than brick walls, but in random rubble walls they should be at least one-half greater. Stones which are too hard to square up can only be built in "Coursed Random Rubble" or "Random Rubble."

ASHLAR-FACED BUILDING IN BATH STONE.

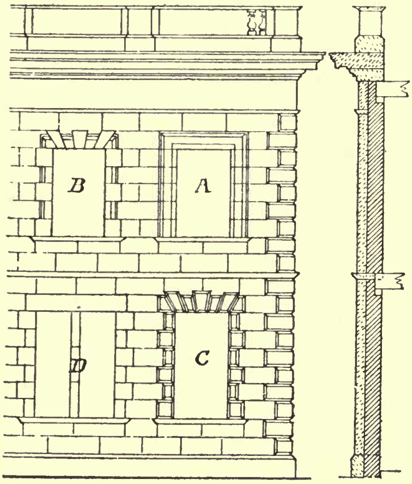
Ashlar work built solid is very expensive, and therefore buildings are often faced with ashlar dressed stone, and backed up with brickwork or rubble stone.

Ashlar-faced Bath stone building. (Clauses Nos. 104 and 105.)

(**104**)—The Bath stone to be from the Corsham Down Quarry, finished with a finely dragged face.

The stonework to be laid with joints $\frac{1}{10}$ in. (to $\frac{1}{8}$ in.) thick, and bedded $\frac{3}{4}$ in. from face in lime (or stone dust) putty, neatly pointed up. (See clause No. 2 for various joints.)

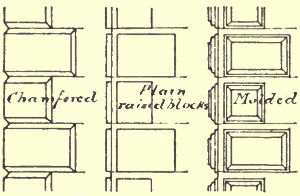
Cement should never come near the external face of Bath stone, as it stains the work.



Case the external walls of building in coursed (or random) Bath stone ashlar 6 in. (to 4 in.) thick, in courses 12 in. (4 in. to 14 in.) high, built in lime mortar, with a bonder stone about 2 ft. superficial area to every superficial yard, going right through to the inner face of the walls. (Give an average length of the stones, or say that they are to be of the lengths shown upon the drawings.)

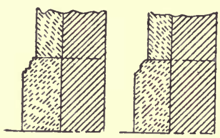
Bond stones may be 3 ft. to 5 ft. apart in each course. State if the ashlar is to be in rusticated courses, either channelled, chamfered or moulded; see Plasterer, clause No. 70.

Quoins.



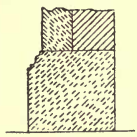
The quoin stones to be laid showing alternately on face 9 in. and 15 in. (or 12 in. and 18 in.) long, and worked out of stones 9 in. (or 12 in.) thick, with chamfered (or moulded) edges (or plain raised blocks).

Plinth.

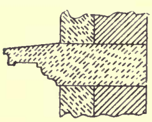


The plinth to be in stones 15 in. deep, 9 in. (or 7 in.) thick, in lengths of not less than 5 ft., projecting 3 in. from main face of walls, and moulded (or twice splayed) on top edge, with bonder stones every 7 ft. apart, going right through to the inner face of the walls.

It is better to let the plinth be in stones solid throughout the thickness of the wall along its length, instead of only occasionally putting bonder stones.

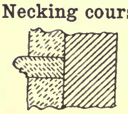


String course.



First floor string course to be 7 in. deep, with a 6 in. moulded, weathered and throated projection, in lengths of not less than 5 ft., and going right through to inner face of walls.

Necking course.

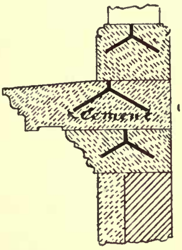


The necking course to be 3 in. deep, 9 in. wide, with a 3 in. moulded and weathered projection.

Frieze. To be similar to the ashlar work, 6 in. (or 4 in.) thick, in stones 21 in. high, and jointed up to the brickwork at the back with neat cement.

State if there be any carving, and allow for the stones to be the extra thickness of the projection of the carving; and if there be an incised inscription on the frieze, give the size of the letters and the sinking.

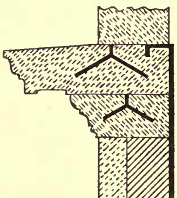
Cornice.



To be formed up in two thicknesses of stone, in lengths of not less than 5 ft., and cramped at joints with galvanised iron cramps 12 in. long, the lower bed being 10 in. deep, 5 in. moulded projection, and bedded right through the thickness of the walls. The upper bed to be 10 in. deep, with a 15 in. weathered, moulded, sunk and throated projection, and bedded 15 in. on walls.

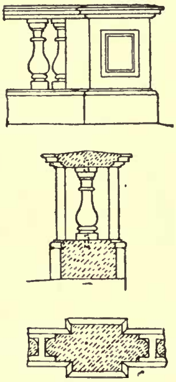
State if there be a dentil course, or any carving to mouldings.

When a cornice has a considerable projection, both beds may go through the thickness of the walls, and in addition holding-down irons 4 ft. long, 3 in. wide × $\frac{1}{2}$ in. metal may be placed every 5 ft. apart, with the lower ends turned into walls 6 in., and the upper ends turned down into the cornice an additional 2 in. or 3 in. See Smith, clause No. 20.



State if a groove (sometimes called a raglet) is necessary in the cornice, or base to balustrade, for turning in the lead flashing of gutter.

Balustrade.



Give depth, width and length of stones to moulded bases, with iron cramps similar to cornice. State width, thickness and length of stones to once (or twice) weathered, moulded and twice throated capping, with copper cramps 8 in. long filled up in sulphur (cement or stone-dust mortar). Give height and thickness of the sunk pedestals (dies), and state that the half balusters are to be worked on solid.

Give height, size and distance apart of turned moulded balusters (or moulded square balusters), and state every seventh baluster is to be dowelled to base and capping with 1 in. slate square dowels

Window and door dressings, mullions and stools.

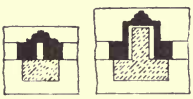
Give size of the moulded jambs and heads (lintels), as window A on sketch, page 124, every fourth stone being a bonder to the inner face of the walls and rebated out to receive frames. If with pilasters on the jambs, frieze and pediment mouldings, give sizes of each.

or,

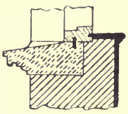
Give size of the projecting, part moulded, and part splayed plain jambs, voussoirs to arches, key stones and imposts, as window B on sketch, page 124, every fourth stone being a bonder to the inner face of the walls and rebated out to receive frames.

or,

The windows and doors may be as C on sketch, page 124, in rusticated work, either chamfered, channelled or moulded, with similar voussoirs, and state every fourth stone is to be a bonder to the inner face of the walls and rebated out to receive frames.

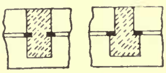


Give size of mullions, see D on sketch, page 124, and state if moulded or otherwise, and if rebated to receive frames.



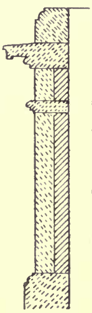
Describe the weathered, throated, grooved and moulded sills, returned and mitred ends, with stools for mullions and jambs worked on.

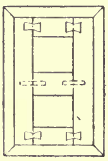
When the stone mullions and jambs show fair on the inner face of the wall, and are glazed with lead lights either with or without iron frames, state they are grooved or rebated out to receive the glazing or iron frames.



Chimney stacks.

Describe the ashlar, the base, necking, cornice, and blocking course. State that the blocking course is to be cramped together with copper cramps or slate dowels. The "withes" between the flues should not be less than 6 in. thick when in stonework.

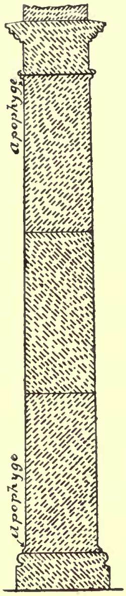




Plan showing cramps and dowels whichever be employed.

Generally, give the correct sizes of all projections, together with the width and height of the stones.

Entrance loggia.



(105)—Describe the columns, bases, caps, pilasters, entablature, balustrading, string course, plinth course, cornice and blocking, with all necessary dowels and cramps, as in clause No. 104. The diminished shafts to columns and pilasters to be worked in (say) three stones each, with the apophyges worked on the shafts.

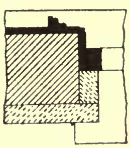
(The apophyges are the small curves joining the narrow fillets between the base and the necking, and unless they are worked on the shaft the effect is unsatisfactory; but of course it is more expensive to do so, as the shaft has to be sunk the amount of the projection of the fillets.)

The beds of columns are sometimes bedded upon 4 lb. lead seatings kept $\frac{3}{4}$ in. in from the face, or they may be bedded on pine, pitch pine or oak seatings $\frac{1}{8}$ in. thick, in a similar way. See Plumber, clause No. 20, for lead seatings. Bath stone columns are generally bedded only in stone-dust mortar.

When walls are built throughout their thickness in ashlar work instead of being only faced with ashlar, the description would remain the same as clauses Nos. 104 and 105, except that no mention would be made of bonder stones, as the whole of the stonework would be bonded together as walling.

Ashlar facing to an old building.

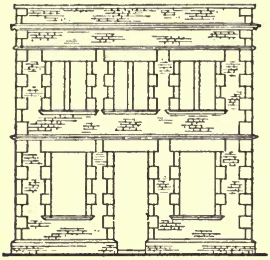
(106)—Sometimes an existing building is faced over with ashlar work. In this case the stability of the building does not depend upon the ashlar work; it may therefore be thinner than ordinary ashlar facing, say 3 in. to 4 in. thick, and bonded into the walls every now and then, say another 4 in. or 5 in. The ashlar may also be tied into the wall with cramps. To put a stone cornice, it would be necessary to take down the old parapet, so that the cornice might bed fairly on the walls, and then to rebuild the parapet. The reveals to doors and windows would require cutting away to allow for the ashlar facing; see sketch.



See Bricklayer, clause No. 108, for other items connected with casing in existing buildings with ashlar.

Brick building dressed with Bath or Portland stone.

(107)—State the class of stone, and if "dragged" or "rubbed," see notes to clause No. 1.



Give the size of the angle quoins, as 12 in. × 6 in. or 18 in. × 9 in.

Describe the plinth, the string course, necking, cornice and coping, somewhat as in clause No. 104.

The plinth in this case would be perhaps only 6 in. to 9 in. deep, bedded $4\frac{1}{2}$ in. in the walls, with a $2\frac{1}{4}$ in. to 3 in. projection. There would be no bonder stones except perhaps to the plinth and strings.

Window and door dressings and mullions.

The windows and doors to be dressed with plain reveal and jamb stones, each stone 12 in. high, 6 in. thick, by 6 in. and 10 in. wide alternately, every fourth stone being a bonder to the inner face of the walls, and rebated out to receive the frames. The mullions to be 9 in. wide, 6 in. thick.

Stone reveals to windows and jambs to doors are seldom less than 6 in. thick.

Lintels.

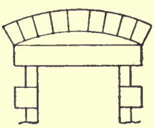
The lintels to be 12 in. deep, 6 in. thick.

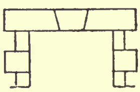
State if reveals, jambs and lintels are stop chamfered or stop moulded.

Sills.

The sills to be 12 in. × 4 in. sunk, weathered, grooved, moulded and throated, with returned and moulded ends, and stools worked on solid to receive the reveals and mullions.

Arches are often thrown over stone lintels to take the weight of



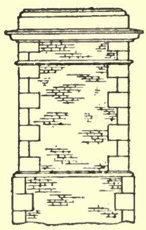


the work above. To prevent stone lintels cracking, it is a good plan to form them with flush key stones, and when rubbed down they will scarcely be noticeable.

Quoins, window and door dressings, strings, plinths and cornices, should be worked to the exact depth of the courses of brickwork, so that they may bond in.

Chimney stacks.

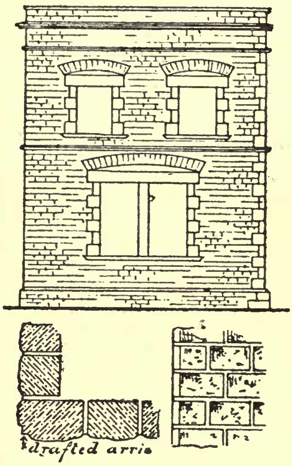
Describe the quoins, the mouldings and other dressings to the chimney stacks, as in clause No. 104.



Kentish rag ashlar faced rubble walling to a building.

(**108**)—See clause No. 28.

Face the external walls with "rough (or close) picked" Kentish rag rubble stone ashlar 6 in. (to 8 in.) thick in lime mortar, with one bonder stone to every superficial yard, going right through to the inner face of the walls. Lay the stones in "Regular Coursed Rubble," in courses 7 in., 8 in. and 9 in. deep (or in "Irregular Coursed Rubble" or "Squared Uncoursed Rubble") and point up in blue ash mortar. The arrises at the angles to be drafted 1 in. wide. (Give an average length of the stones.)



The arches to be formed with voussoirs 9 in. (to 12 in.) deep.

Describe the Bath or other stone dressings as clause No. 107.

See notes preceding clause No. 104 for the various classes of walling.

If the quoins and angles are dressed in Bath or similar stone, the angles of the Kentish rag will not require drafting.

If the walls be built in solid Kentish rag stone throughout, the inner lining may be in Hassock—that is an inferior class of Kentish rag.

There are many other similar kinds of stones, which would be described in a similar way to Kentish rag faced walls.

Stone which is too hard to square up may be built either as ashlar facing with a brick backing, or as solid walling; but it can only be built as "Random Rubble," or "Coursed Random Rubble," see notes preceding clause No. 104 relating to this. The dressings and quoins may in this case be in brick or worked stone.

Fence or boundary rubble walling.

(**109**)—May be built in Kentish rag (or similar stone) either dry, or in mortar in:—

Uncoursed Random Rubble,
Coursed Random Rubble,
Squared Uncoursed Rubble,
Irregular Coursed Rubble, or
Regular Coursed Rubble.

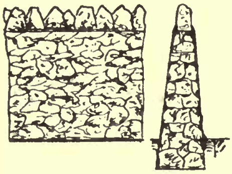
See notes preceding clause No. 104, relating to rubble walling.

If the walling surround a building, it should be built in mortar, and pointed up either in blue or ordinary mortar (or cement), with the coping roughly worked (or tooled) and set in cement. If round a field it may be built dry.

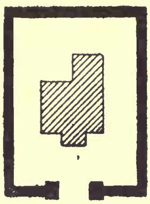
When the fence walls are built dry, the coping is often built in cement or mortar.

Rubble fence walling should be at least 18 in. to 20 in. thick, or one-third to one-half thicker than that required for brick walling.

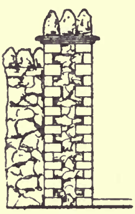
Stone used in fence walling which is too hard to square up, can only be built either as "uncoursed random rubble" "or coursed random rubble," see notes preceding clause No. 104 relating to this. It should diminish from the base to the top, and be finished with a similar rough stone coping. If the wall be built in mortar, the coping should be in cement; but the walling may be pointed up in mortar or cement or else be tuck pointed in cement.



Here is a description:—



Build the fence walls around the building in "uncoursed random rubble" (or "coursed random rubble") Malvern Hill stone (a very hard stone, it can only be laid as random rubble) 6 ft. high above the ground and 2 ft. below, diminishing from 2 ft. thick at the base to 16 in. at the top, set in mortar, and finished off with a similar rough stone coping laid and weathered off in cement. Rake out the joints, fill up in cement, and tuck point in cement.



Put Bath stone (or other stone or blue brick) angle quoins, 18 in. and 9 in. wide alternately, with similar rebated jamb stones to gate opening, and a 4 in. tooled (or rubbed) hard York threshold. Describe the gate as clause No. 98 in Bricklayer; and the lock and hinge stones as in Mason, clause No. 59.

For other boundary walling see Bricklayer, clauses Nos. 98, 99, and 105 to 107.

Granite.

(Clauses Nos. 110 to 116.)

See clause No. 30.

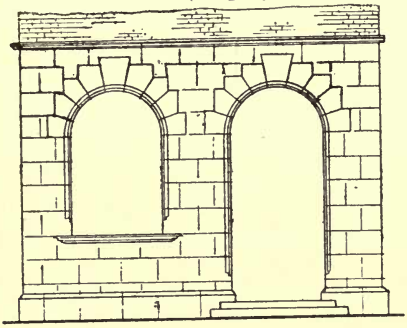
Granite may be roughly axed, finely axed, sparrow picked, or polished on face. State which, and give the class, such as red or grey granite, and where obtained.

Generally.

(110)—The granite is to be specially selected, so that no stone shall show black or foreign spots, or other blemishes.

Granite faced building. (Clauses Nos. 111 to 113.)

(**111**)—Case the external walls of building on ground floor from plinth to string course, in finely axed red (or grey) Aberdeen granite coursed ashlar 9 in. thick, in courses 12 in. (to 18 in.) high, built in cement mortar, and neatly pointed up, with a bonder stone about 2 ft. superficial area to every square yard, going right through to the inner face of the walls. (Give an average length of the blocks, or say that they are to be of the lengths shown upon the drawings.)



Plinth.

The plinth to be in stones 15 in. high, 12 in. thick, in lengths of not less than 5 ft. projecting out 4 in. from the main face of the walls and moulded on top edge, with bonder stones every 7 ft. apart going through to the inner face of the walls.

The plinth may be solid throughout, see notes to clause No. 104.

Cornice or string course.

The string course (or cornice) to be 10 in. deep, with a 12 in. moulded, weathered, sunk and throated projection, in lengths of not less than 5 ft., and bedding right through to the inner face of the walls.

Arches.

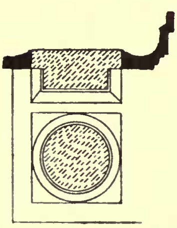
Form the arches to door and window with voussoirs; the reveals of jambs and arches being moulded 6 in. girth. Every fourth stone in the reveals of windows and jambs of doors to be a bonder, going right through to the inner face of the walls, rebated out to receive the frames.

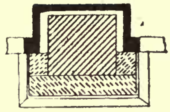
Window sills.

The window sills to be 14 in. × 6 in., sunk, weathered, moulded, grooved, and throated, with returned and mitred ends, and stools worked on solid to receive reveals.

Columns to entrance loggia.

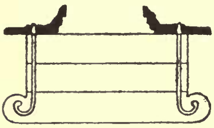
(**112**)—The columns, pilasters, caps and bases to entrance loggia to be in polished red (or grey) Aberdeen granite, with the caps and bases moulded, the shafts being in one (two or more) stone, bedded on 4 lb. lead seating, and tapering up from one-third the height, with the apophyges worked on and the joints neatly pointed up. (See Plumber, clause No. 20, for lead seating.) (See clause No. 105 as to the apophyges and bedding of columns.)





Pilasters to shop fronts are often faced up in polished granite, instead of being solid.

Entrance steps.



(113)—The entrance door-steps to be in 15 in. × 6 in. solid Aberdeen granite, each in one 9 ft. length, weathered $\frac{1}{4}$ in.; finely axed on top, front face and ends; back-jointed and set in cement, and mortise holes cut for balustrade.

Describe the balustrade as clause No. 46 in Smith.

Granite paving. **(114)**—See clause No. 14 under "Road-making."

Granite pitching. **(115)**—See clauses Nos. 30 and 31 under "Road-making"; and Pavior, clauses Nos. 10 and 11.

Spurs to gate. **(116)**—See Carpenter, clause No. 266.

Kentish Rag spurs are often used in place of granite, and are very suitable.

Marble.

(Clauses Nos. 117 to 128.)

In all cases state the class of marble, such as Sienna, Rouge Royal, Sicilian, Dove, Statuary or Black.

See clause No. 29.

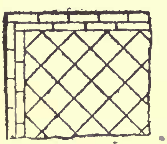
Marble 1 in. thick weighs about 14·33 lbs. per ft. super.

Portland cement if used in the setting will stain the delicate white marbles; stone dust and lime may be used externally, and plaster of Paris internally.

The polished face on marble does not stand the weather well in this country.

Marble Mosaic and Tesseræ paving to hall and vestibule. **(117)**—See Pavior, clauses Nos. 2 and 3; and notes to clause No. 1 under Pavior.

Marble paving to halls and passages.



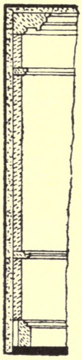
(118)—Pave the halls and passages on ground floor with 1 in. (or $\frac{3}{4}$ in.) Sicilian and black marble tiles alternately, sawn and jointed in 12 in. squares and half squares, with black and Sicilian marble border lines 6 in. and 4 in. wide, and lay in stone dust and lime mortar (or cement) on a bed of 6 in. Portland cement concrete, floated up with a $\frac{3}{4}$ in. cement and sand face. The Sicilian marble tiles to be sanded, and the black marble tiles to be sanded and gritted and cleaned off.

Marble tiles are made in 6 in. to 18 in. squares.

Marble paving may be laid in large slabs 1 in., $1\frac{1}{4}$ in., $1\frac{1}{2}$ in. to 2 in. thick, either on concrete or on sleeper walls. See Bricklayer, clause No. 28, for sleeper walls.

Marble wall lining.

(119)—Line walls of hall with 1 in. sawn, jointed and polished Devonshire (or other) marble slabs, set in plaster of Paris, and cramped to walls with copper cramps, the dado and frieze being in different coloured marbles.



Describe the skirting, such as 12 in. × $1\frac{1}{2}$ in. moulded, twice sunk and polished; the dado rail as 4 in. × 3 in. moulded and polished; the frieze rail as 4 in. × 3 in. moulded and polished; and the cornice as 8 in. × 6 in., moulded, sunk and polished.

Marble wall linings may be $\frac{3}{4}$ in., 1 in., $1\frac{1}{4}$ in., $1\frac{1}{2}$ in., $1\frac{3}{4}$ in., 2 in., $2\frac{1}{2}$ in., 3 in., 4 in., 5 in. and 6 in. thick. The walls must be rendered over in cement or plaster to form a backing.

Marble columns.

(120)—Give the diameter, state if the shafts are in one or more stones, with the apophyges worked on. Mention the polishing, and any carving or other labours, and the class of marble. (See clause No. 105 as to the apophyges.)

Marble staircase.

(121)—State the class of marble, such as Sicilian or vein, and state it is to be polished. The description of the steps and other parts would be somewhat similar to clauses Nos. 75 to 77.

For marble-lined steps see clause No. 128.

Marble hearths.

(122)—The front and back hearths to the three reception rooms to be $1\frac{1}{4}$ in. ($1\frac{1}{2}$ in., 1 in. or $\frac{3}{4}$ in.) polished Sicilian marble, set in stone dust and lime (or cement), back-jointed, notched to chimney-pieces, and bedded on concrete, floated up with a $\frac{3}{4}$ in. face in Portland cement and sand. The front hearths to be 18 in. longer than the fireplace openings, and 18 in. in width.

See notes to clause No. 51; and notes to clause No. 6 under Pavior.

Frequently the back hearth is in polished black marble, with a front hearth of a different kind. For other kinds of hearths see notes to clause No. 51.

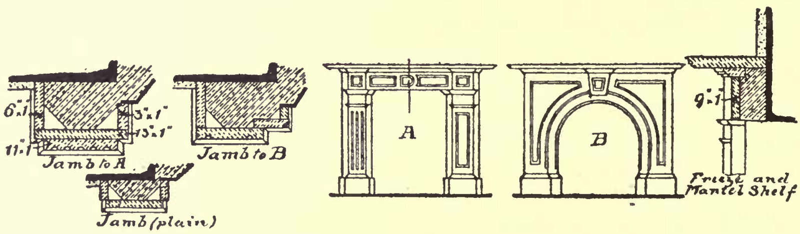
Marble kerbs. (**123**)—See Pavior, clause No. 6. Put $4\frac{1}{2}$ in. × $3\frac{1}{2}$ in. rounded polished Sicilian marble kerbs to the hearths of the three reception rooms, copper dowelled together at joints and to chimney-pieces, and set in stone dust and lime (or cement) with the under side kept 1 in. below flooring level.

For other hearth kerbs, see clause No. 52 and notes.

Boxed marble chimney-pieces. (**124**)—Allow a p.c. sum for chimney-pieces, and state that they are to be set in plaster of Paris, with copper cramps pinned into walls, and the plastering made good around, and the boxings filled up solid in brickwork.

Marble chimney-pieces may be described in detail, giving the sizes of the jambs, frieze and mantel-shelf, and stating the labours, mouldings, and carving, and that the whole is to be blocked out and set together in plaster of Paris, and copper cramped to walls. The jambs and frieze are usually $\frac{3}{4}$ in., 1 in. or $1\frac{1}{4}$ in. thick; and the mantel-shelf $1\frac{1}{4}$ in., $1\frac{1}{2}$ in., or 2 in. thick.

Here are a few sketches showing their construction:—



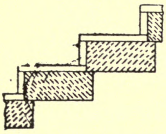
The mouldings on the mantel-shelf should be thus  , and not thus  , as ornaments are more apt to slide off. The width of shelf may be from about 12 in. to 18 in. The kind of stove used governs the distance of the jambs apart, and the height up of the frieze. For sizes of ordinary stoves, see Smith, clause No. 81. For other chimney-pieces, see clause No. 53; Smith, clause No. 74; Carpenter, clause No. 215; and Slater, clause No. 18. For marble slips to stoves, see Carpenter, clause No. 215. Filling the boxings up solid prevents any smoke discolouring the marble; it is also a preventive against fire, and should be done in every case with boxed chimney-pieces.

Clean old chimney-pieces. (**125**)—Pickle and clean old marble chimney-pieces.

Lavatory top. (**126**)—See Plumber, clause No. 36.

Coil case tops. (**127**)—See Smith, clause No. 106.

Marble-lined steps.



(**128**)—Cover the existing steps to entrance with $1\frac{1}{2}$ in. (or $1\frac{1}{4}$ in.) polished sawn Sicilian (or other) marble treads and 1 in. similar risers, set in stone dust and lime. The landing to be finished in one slab $1\frac{1}{2}$ in. (or $1\frac{1}{4}$ in.) thick.

State if with moulded nosings. For tile-lined steps, see Pavior, notes to clause No. 3.

CARPENTER, JOINER AND IRONMONGER.

In parts, much of the joinery work is described more in detail than is customary, in order to make the items clearer.

Always state if work is wrought, framed, moulded, or double quirk (staff) beaded, and if circular. A staff bead requires two labours to mould it, an ordinary bead only one.

All glass panels where subject to jars should be bedded in wash-leather as well as in putty.

Scaffolding.

(1)—The scaffolding to be erected in accordance with the architect's instructions, and removed when desired.

This clause should come more properly under Excavator, as the work is done by scaffolders, and not by skilled mechanics; see notes preceding clause No. 1 in Excavator.

Timber generally.

(2)—All timber to be the best of its kind, perfectly dry, thoroughly well seasoned, sawn die square, free from sap, shakes, cracks, waney edges, loose and dead knots, or knots over $1\frac{1}{4}$ in. diameter, and any other defect. Cut timber into scantling lengths immediately after signing the contract.

Timber may be seasoned either by stacking in the open air under cover, or by immersing in water; the former method being preferable.

The safe load to put on timber pillars and story posts should not exceed one-fifth the breaking weight for dead loads, or one-tenth for live loads.

Timber for joinery work is sometimes required to be dried in a drying chamber, then framed and fitted together and dried again; and then squared, shot and glued up.

Guarantee as to quality.

(3)—The timber for joiners' work to be obtained from an approved London (or other port) merchant, who will give a guarantee as to its having been in stock four years, and that it will not shrink when fixed. The contractor is to obtain this guarantee in such form as the architect shall require, but this guarantee will not relieve the contractor from his liability in any way for the quality of the material. The timber for the joinery must be specially selected, and be free from knots over $\frac{1}{2}$ in. diameter.

Shrinkage of joinery.

(4)—If the joints of any joiners' work should give or open in the least before the payment of the final balance, such defective joinery is to be taken down, refitted and redecorated, or new joinery put in place, as the case may be; and any work disturbed around must be made good at the contractor's expense.

Timber may be divided into two classes, "soft" and "hard."

Soft woods include firs and pines.

Hard woods include oak, elm, teak and other hard woods.

"Fir" (whether red or yellow, which is the same) is generally understood to be timber from the Baltic ports.

Pine is understood as timber of a somewhat similar nature obtained either from the Baltic ports or North America.

Spruce (or white fir) is understood as timber obtained either from Norway or America.

A log is the tree itself roughly shorn of its branches.

Balk timber is a roughly squared log.

"Planks" are timbers 11 in. wide by 2 in. to 6 in. thick, and up to about 21 ft. long; but they are seldom obtained more than 4 in. thick.

"Deals" are timbers 9 in. wide by 2 in. to 4 in. thick, and up to about 21 ft. long.

"Battens" are timbers 7 in. wide by 2 in. to 4 in. thick, and up to about 21 ft. long.

The market sizes of fir timbers are 11 in. × 4 in., 11 in. × 3 in., 11 in. × 2 in., 9 in. × 4 in., 9 in. × 3 in., 9 in. × $2\frac{1}{2}$ in., 9 in. × 2 in., 7 in. × 4 in., 7 in. × 3 in., 7 in. × $2\frac{1}{2}$ in., 7 in. × 2 in., and their halves in depth by the same widths. If larger scantlings be required, they must be cut specially out of balk timber.

American spruce (white fir) is imported in 12 in. × 4 in. and 12 in. × 3 in. sizes, but it is an inferior timber to that from the Baltic.

Timber generally will stand either a dry or thoroughly wet place, but soon perishes if subject to both alternately. Creosoting timber under this latter condition will about double its life, see clause No. 26.

Dry rot occurs in timbers through want of ventilation, especially in warm moist places.

Varnished or enamelled work.

(5)—Woodwork to receive enamel paint is to be finished with a glass-papered surface, so that the plane marks do not show. That to receive varnish to be finished straight from the tool.

This clause may, perhaps, come under Painter; see clause No. 1 in Painter.

Enamelled woodwork is paintwork very carefully executed and varnished over; and unless the woodwork be very finely glass-papered, every small irregularity will show. It is especially noticeable when paintwork is finished a white enamel.

Sizes of wrought and unwrought timbers.

(6)—Unwrought timbers when fixed, to hold the full dimension specified.

In timber wrought both sides, a bare $\frac{1}{8}$ in. less than the specified thickness will be allowed; thus, stuff specified as 1 in. thick is to hold full $\frac{7}{8}$ in.

In timber wrought only one side, $\frac{1}{10}$ in. less than the specified thickness will be allowed; thus, stuff specified as 1 in. thick is to hold $\frac{9}{10}$ in.

If wrought timbers are to be the full thickness specified, state it.

Exposed faces. All exposed faces to be wrought, except where otherwise described.

The word "wrought" is repeated in many parts merely for the sake of clearness, but it is unnecessary to do so if the above paragraph be inserted in a specification.

Meaning of word "framed." (7)—The word "framed" as applied to woodwork, is to be understood as including all the best known methods of joining woodwork together, by mortise, tenon, dovetail, or other method. In jointing elliptical, segmental or circular work together, oak keys, wedges, pins or hand rail screws are to be included in addition.

Joints and angles. All joints and angles of joinery to be glued and cross tongued with hard wood tongues. Joinery work over 9 in. wide to be panelled.

Stacking joinery. (8)—All framing and panelling to be roughly framed together, and stacked for three months before glueing up.

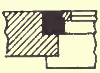
Bed window frames. (9)—All window frames to be bedded on the stone, brick or terra-cotta sills in white lead $\frac{1}{16}$ in. thick. The timber sills to project 3 in. longer each way beyond the frames, and be painted three oils on the under side.

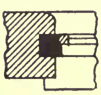
This clause may take the place of clause No. 140.

Build in frames. (10)—Door and window frames to be built in as the work proceeds.

Secure door frames. Door frames to be secured every 2 ft. apart with $1\frac{1}{2}$ in. $\times \frac{3}{16}$ in. wrought-iron ties 18 in. long, tarred and sanded (or galvanised), turned up and screwed to the frames at one end, and turned down 3 in. into the brick or stone work at the other end.

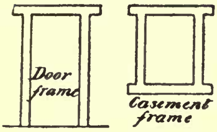
Secure window frames. Frames to solid casements and to hung sashes when built in reveals, to be secured every 2 ft. apart with $1\frac{1}{2}$ in. $\times \frac{1}{16}$ in. hoop iron 2 ft. long, tarred and sanded (or galvanised), turned up and spiked to the frames at one end, and turned down 3 in. into the brick or stone work at the other end. But where built in a chase these ties are not to be supplied.





Thus, in salt glazed and enamelled brickwork, the wood linings to windows not being necessarily provided, the iron ties assist in keeping the frames in place when built in reveals. See Bricklayer, notes to clause No. 89, for enamelled brick reveals.

Horns.



The horns to door and casement frames to be left on 3 in. (to 6 in.) wider each way.

The paragraphs in this clause may come immediately before the description of windows and doors respectively ; see clauses Nos. 140 and 237.

Open joints of floors. (**11**)—If the joints of the floor boards open $\frac{1}{16}$ in. before the payment of final balance, the flooring is to be taken up and relaid at the contractor's expense.

Protect floors. All timber floors, whether wood block or otherwise, to be protected during the work with sawdust $1\frac{1}{2}$ in. thick, and the floors left clean from stain.

The paragraphs in this clause may come immediately before the descriptions of flooring, see clause No. 58.

Rebate skirtings to floors. (**12**)—All skirtings to be rebated to floors.

This clause may come immediately before the description of skirtings, see clause No. 192. It is only in first-class work that skirtings are rebated to the floors.

Distances of main timbers apart. (**13**)—No joists, rafters or quarters to be more than 13 in. from centre to centre.

They are often placed 12 in. apart, but of course 12 in. or 13 in. centres makes stronger work.

Fir. (**14**)—Constructional timbers to be of sound, hearty crown yellow (red) Memel, Dantzic, Riga or Swedish fir.

Memel and Dantzic fir comes from Prussia, and Riga fir from Russia. They are all suitable timbers for constructional work, though now very scarce in the market, but are generally used in church roofing.

Swedish red timber is now mostly used for constructional timbers in ordinary building work. Pitch pine is much used for heavy timbers.

American, Swedish or Scotch fir is not to be used.

The word Swedish in this latter paragraph would be omitted if Swedish timber be permissible.

In these days much of the fir used does come from Sweden and Norway, but it is not equal to that from Russian or Prussian ports.

Deal for exterior joinery. (**15**)—Deals for external joiners' work and backings to framings to be best yellow (red) Christiania, Archangel, Onega or St Petersburg.

Archangel red deal is now much used in all joinery work. There is very little Christiania in the market.

Deal for internal joinery. Deals for internal joinery to be best white Christiania or white Archangel.

The white deal makes cleaner work, but the red is more lasting. Archangel white is now mostly used, there being very little Christiania white in the market.

St Petersburg, Onega and Archangel deal come from Russia, and are all most suitable for joinery; but perhaps Onega deals are the best.

Christiania deal comes from Norway, and is also suitable for all joinery, but is now very scarce in the market. The white Christiania should only be used for internal work, as also the white Archangel.

Swedish deal is not used in the best work; but the Swedish, Gefle and Stockholm deal, both yellow and white, are much used for floors. White deal should only be used where there is no question of dampness.

First class joinery is often done entirely in American pine.

Deals for flooring. (**16**)—Deal for floors to be yellow Archangel (or Gefle), cut down in narrow widths upon importation.

or,

in poor class work,
Deal floors to be "Swedish" imported "white."

Yellow deal is always superior to white. Best white Christiania or Archangel deal is sometimes used in upper floors, as it makes very clean work.

Spruce. (**17**)—The spruce (white fir) to be from Norway or America.

Spruce is suitable for dressers, table tops and shelves. It is also used for constructional timber in poor class work.

Pine. (**18**)—The pine to be first quality dry Montmorency brand,

or

The pine is to be first quality yellow (white) North American pine.

Pine is very free from knots, and can be obtained in greater widths than deal. It is very suitable for wide panels, makes clean mouldings and does not shrink. White and yellow pine is exactly the same wood. Quebec and Oregon pine is mostly used. Canadian red pine is not so good as the North American pine. Bass wood (white American wood) is also very suitable for panels and mouldings; it has a greenish tint, and is generally used for electric light wire casings.

Oak timbers. (**19**)—The oak in sills, joists, posts and other constructional work to be English; Suffolk or Monmouthshire growth.

English oak in large timbers is suitable for any heavy work, but not for joinery as it is liable to split.

Oak framings and flooring. The oak for flooring, panelling and joinery work to be Austrian Trieste (or Hungarian Fiume) (or Russian Riga) (or Dantzic Crown Memel), and prepared for French polishing.

Riga oak is very scarce. American oak is rather poor, but used in flooring.

Oak corrodes ironwork. Wainscot oak is obtained from Riga or Memel, and owing to its beautiful figure is most suitable for joinery work; but it is now somewhat scarce in the market, the Austrian Trieste and Hungarian Fiume oak having almost entirely taken its place.

Teak for joinery. (20)—The teak to be from Moulmein or Bangkok (or Johore or Rangoon), and prepared for French polishing.

Teak comes from India and countries near, and is used both for constructional work and joinery. It does not corrode iron. Teak from Moulmein and Bangkok is most suitable for joinery, and from Johore and Rangoon for constructional work.

Mahogany. (21)—The mahogany to be Honduras (or Spanish), of selected figure, and prepared for French polishing.

Honduras mahogany comes from Central America, and is suitable for any joinery work; it is not liable to shrink, but does not stand the weather well.

Spanish mahogany comes from the West Indies, and, owing to its beautiful figure, is chiefly used for panelling and veneers.

Walnut. (22)—The walnut to be American black Virginia.

Walnut comes from America, and, owing to its beautiful figure, is used chiefly in joinery and veneers.

Pitch pine for joinery. (23)—The pitch pine to be American, of selected figure, clean, free from knots or coarse grain, secretly nailed, and prepared for polishing.

Pitch pine is used mostly for piles, flooring and panelling; it is very liable to shrink, but has a fine figure. It is also now much used in the constructional timbers of a building, it being imported in the same sizes as fir, which see in the notes under clause No. 4. Pitch pine is not so suitable to take a tensional as a compressive stress.

In cheaper work, oak, mahogany, walnut and pitch pine are varnished instead of polished.

Elm. (24)—The elm to be English.

Elm is suitable for piles, but is seldom used in joinery.

Greenheart. (**25**)—The greenheart to be from British Guiana.

Greenheart is the strongest timber used, and most suitable for piles; it stands salt water well.

Creosoting. (**26**)—The Baltic fir timber when described to be creosoted, to be impregnated with 6 lb. (to 8 lb.) of creosote oil per cubic foot of timber.

Creosoting preserves the life of timber, and when timber is subject alternately to wet and dry situations it about doubles its life.

Soft woods will take as much as 10 lb. of creosote per cub. ft., and hard woods not much more than 3 lb. per cub. ft. One gallon of creosote weighs 10 lb.

Piles, and wood paving to roads are often creosoted for preservation. Paint and tar will preserve timber, providing it be dry when the paint or tar is applied. Timber such as ends of posts buried in the ground, may be charred; and in fact timber or joinery in any position subject to damp may be charred over.

Glue. (**27**)—The glue for outside work to be marine, for inside work Russian.

Ironmongery. (**28**)—The ironmongery to be of the best finish and strongest description, and fixed with screws.

Door furniture and brass work to be fixed with brass (or copper) screws, and nickel furniture with nickel screws. The brass (or nickel) plates to window furniture to be let in flush with the woodwork.

Iron furniture to doors and windows, except hinges, to be japanned, unless otherwise described.

Door furniture to consist of two roses, two drop escutcheons, two large and two small finger plates.

Brass roses to be 2 in. diameter.

Porcelain roses to be $2\frac{1}{4}$ in. diameter.

Iron butts to be of wrought iron.

Roses to doors may be elliptical shape, about 2 in. $\times$ $1\frac{1}{2}$ in.

Spherical roses are frequently only $1\frac{3}{4}$ in. diameter.

Cast-iron butts are used in inferior work.

It is almost better to put a separate p.c. amount for the ironmongery to each separate door, window or other fitment requiring ironmongery. The fittings can then be selected, and there will be no question of the contractor putting inferior fittings, which is often the case when no amount is specified.

Case up work. (**29**)—See clause No. 36 under Preliminary Items.

Fixings and finishings generally. (**30**)—Supply all necessary backings, grounds, fillets, moulds, templates, beads, pallets, wood bricks, slips, furrings, finishings and fixings. Pallets and wood bricks to be every 2 ft. apart.

Wood bricks are liable to shrink and get loose; wood pallets are preferable. In place of wood bricks, joinery may be fixed to concrete bricks (blocks) composed of 4 to 6 parts coarse breeze from gas-works (avoiding Canel coke) to 1 part Portland cement. Concrete lintels may be made in the same way, in the proportions of 4 to 7 parts breeze to 1 cement. See clause No. 43 for wood lintels.

Attend upon other trades.

(31)—See clause No. 25 under Preliminary Items.

Centering.

(32)—Supply, fix, ease and afterwards remove the centering and turning pieces to arches, vaults, trimmers and groining.

Springers.

(33)—Put 4 in. × 2 in. deal feather-edge springers to hearth trimmers.

This clause may come under floors, preceding clause No. 46.

Staging to concrete floors, roofs and walls.

(34)—Erect, ease and afterwards remove staging, planking and props (or centres) to concrete floors, roofs and walls. The outside planking to concrete walls to be planed on the one side.

See Excavator, clauses Nos. 40 and 47; and Bricklayer, clause No. 110.

Bore joists for ventilation.

(35)—Certain joists to the upper floors to be bored for the circulation of air, in such positions as the architect shall direct.

This clause may come under floors, preceding clause No. 46.
Also see notes to clause No. 53 for ventilation to upper floors.

Cutting joists for pipes.

(36)—See clause No. 1 under Gasfitter.

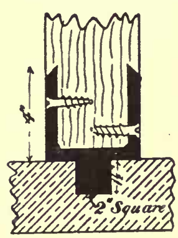
This clause may come under floors, preceding clause No. 46.

Ends of timbers.

(37)—The ends of all joists and timbers to be tarred where buried in brick or stone work.

Shoes.

(38)—All solid door frames to be shod with cast-iron moulded shoes $\frac{3}{8}$ in. (or $\frac{1}{2}$ in.) metal, 4 in. deep on face, screwed to frames, and with the tenons mortised into thresholds.

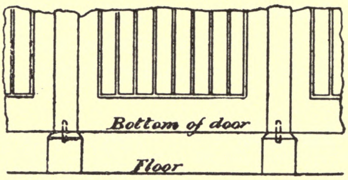


or,

All solid door frames to be dowelled to stone thresholds, with 1 in. square solid copper (slate or iron) dowels 4 in. long.

See sketch under Mason, clause No. 19; and see Smith, clause No. 64.

Door frames are sometimes fixed with dowels on stone seatings, especially when the door is not carried down to the ground, as is often the case with closets in schools; see Mason, clause No. 56.



Bracketing.

(**39**)—Bracket out for cornices and girders.

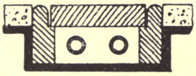
This clause modified may come under clause No. 9 in Plasterer.

Pipes in ground.

(**40**)—All gas and water pipes buried in the ground to be laid in 1 in. rough deal tarred troughs, filled with liquid pitch (or asphalt).

Also see Plumber, clause No. 23; and clause No. 5 in Gasfitter.

Case in pipes.



(**41**)—All gas, and hot and cold water service pipes where exposed to draughts or in cold situations, to be bound round with hair felt and canvas, and where pipes pass through staircases or principal rooms, they are, in addition, to be cased in with 1 in. wrought pine hinged flaps, in rebated and beaded frames, with brass hinges and fastenings.

See also clauses Nos. 23 and 63 in Plumber; and clause No. 1 in Gasfitter. Waste pipes would not necessarily require felting round or casing in.

Old doors and sashes reused.

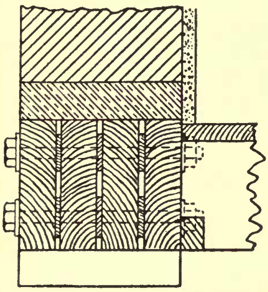
(**42**)—The old doors, windows, linings and finishings may be reused if approved by the architect; but should they not be of sufficient size to fill the new openings, then new joinery and glass must be provided. In any case, the ironmongery must be entirely new, to match the other new work.

This clause applies when old joinery is allowed to be reused; also see clause No. 53 under Preliminary Items.

Lintels. (43)—Put fir lintels over all internal openings to doors, windows and similar openings, the full width of the internal parts of the walls, each lintel is to have a depth of 1 in. (or $1\frac{1}{4}$ in.) for every foot width of span, and the ends to rest 9 in. on either side of openings; but no lintels to be less than 3 in. deep. (They may have stone templates; see Mason, clause No. 38.)

Lintels should always have arches over them to take the weight above, see Bricklayer, clause No. 39; unless they are to act as bressummers, when in that case they must be strong enough in themselves to carry the weight above. See notes to clause No. 30 for concrete lintels.

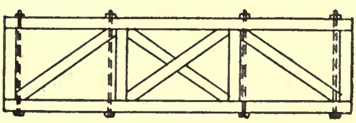
Bressummer.



(44)—The bressummer over bay window opening to consist of (say) four timbers, each 11 in. × 3 in., placed $\frac{1}{2}$ in. apart with wood slips, and bolted together with $\frac{1}{2}$ in. (or $\frac{3}{4}$ in.) diameter wrought-iron bolts, heads, nuts and washers. The ends of bressummer to be cased in cast-iron shoes $\frac{5}{8}$ in. metal, 10 in. long, and to rest 9 in. on walls, with 14 in. × 18 in. × 3 in. tooled York templates under, and a 14 in. × 3 in. tooled York cover stone above. Spike on to one side of bressummer, a $2\frac{1}{2}$ in. × 2 in. rough deal fillet to receive the ends of joists.

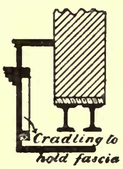
The safe load on timber bressummers should not exceed $\frac{1}{5}$th the breaking weight. The $\frac{1}{2}$ in. space left between the timbers is for ventilation. Rolled iron or steel joists have almost entirely taken the place of wood bressummers. The scantlings will, of course, vary in size, according to the span of opening. For iron flitch bressummers, see notes to and clause No. 124; and Smith, clause No. 18.

Cradling.



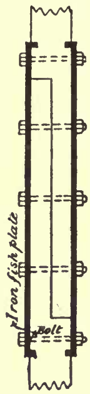
(45)—Form the cradling over shop front, with $4\frac{1}{2}$ in. × 3 in. studs, heads, sills and braces, having a $\frac{1}{2}$ in. (or $\frac{3}{4}$ in.) wrought-iron bolt, with nuts, heads and large washers at each stud.

Also see under clause No. 315 for cradling to shop front.



The sizes of timber for cradling will vary according to the span; the sketch will show where cradling to a shop front is required. Cradling may be required in other positions across any opening.

Story posts.



(**45a**)—Story posts are used for supporting bressummers to shop fronts, and in similar positions; but steel and wrought and cast iron stanchions have taken their place in most cases. Timber story posts should be either square or circular in section, and not more than twenty diameters high. The safe load should not exceed $\frac{1}{10}$ the breaking weight. Rectangular posts are a waste of material, as the strength of the whole is that of its weakest part.

The sketch shows a scarf in a post to resist compression.

Floor Timbers.

(Clauses Nos. 46 to 57.)

A crowd of people weigh from 84 lbs. to 110 or 120 lbs. per super. ft.

Horses weigh from 11 cwt. to 18 cwt. each.

Hay weighs from 5 lbs. to 8 lbs. per cubic ft.

Straw weighs from $3\frac{1}{2}$ lbs. to $5\frac{1}{3}$ lbs. per cubic ft.

A truss of hay contains from 7 ft. to 11 cubic ft., and measures about 3 ft. $\times$ 21 in. $\times$ 26 in.

A truss of straw contains about 11 cubic ft., and measures about 6 ft. 6 in. $\times$ 18 in. $\times$ 18 in.

Coal weighs from 50 lbs. to 58 lbs. per cubic ft., and 1 ton of coal weighs 20 cwt.

One cwt. of oats occupies 3·64 cubic ft. of space.

One cwt. of barley occupies 2·38 cubic ft. of space.

One cwt. of wheat occupies 2·20 cubic ft. of space.

Offices and dwelling house floors should be constructed to carry a load of $1\frac{1}{4}$ cwt. to $1\frac{1}{2}$ cwt. per super. ft.

Public buildings, lecture halls and schools should be constructed to carry a load of $1\frac{1}{2}$ cwt. to 2 cwt. per super. ft.

Warehouses, factories and mills should be constructed to carry a load of 2 cwt. to 5 cwt. per super. ft., according to their respective requirements.

In addition to these several loads, the weight of the floor timbers must be added. As a crowd of men weigh from 84 to 120 lbs. per super. ft., floors to lecture halls and public buildings are constructed to carry that load as a moving load, or from $1\frac{1}{2}$ to 2 cwt. per super. ft. A moving load is generally taken as twice that of a stationary load; hence the strength of any bridge or gangway crossing an opening should be based upon that calculation.

In exit passages it is sufficient to allow 1 ft. in width for every 50 persons accommodated; thus, in a hall holding 500 persons, the exit passage should not be less than 10 ft. wide; and if a slope be absolutely necessary in the passage, it should not exceed 1 in. fall in a foot length. The London County Council require that staircases and passages to buildings where the general public meet, shall be 3 ft. 6 in. wide when the building accommodates up to 200 persons; when over 200 and up to 400 persons, then not less than 4 ft. 6 in. wide; when over 400 persons, then 6 in. more in width for every additional 100 persons up to a maximum width of 9 ft., but in all cases they must be divided with a handrail when over 6 ft. wide.

The ends of joists, girders, and in fact of all beams, should have a circulation of air around them; they may also have the ends charred or tarred.

The following are the weights of some of the chief building timbers:—

Fir (Baltic)	weighs per cubic ft. about	34	to	40	lbs.
Pine (American)	„	32	„	34	„
Elm (English)	„	34	„	39	„
Mahogany (Honduras)	„			35	„
Oak (English)	„	48	„	58	„
Pitch pine	„	41	„	58	„
Teak	„	41	„	60	„
Greenheart	„	58	„	72	„

When, for some reason, joists shallow in depth are laid directly upon paving, they must be securely fixed to it, otherwise they are liable to spring.

Broadly speaking, there are three methods of constructing timber floors:—

First, "single-joisted floors" ("single floors"), these are mostly used in basements, and also in ground and upper floors when the spans do not exceed more than from 18 to 20 ft.

Secondly, "double floors," these are used in floors of larger spans than 18 to 20 ft.

Thirdly, "framed floors," these are used in floors of considerable spans.

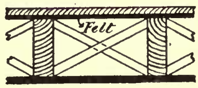
The sizes of joists and timbers suitable for "single," "double" and "framed floors" for the various spans required, may be obtained from any of the architects' pocket books.

The uppermost timbers of all floors are called "bridging joists."

Pugging.

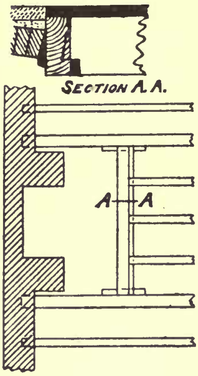
(46)—Pug all floors (except, perhaps, those on ground level) with coarse stuff plaster 3 in. deep, laid on $\frac{3}{4}$ in. (or 1 in.) rough deal boarding, with 1 in. $\times 1\frac{1}{4}$ in. fillets (or angle fillets two out of 2 $\times 1\frac{1}{4}$ in.) spiked to joists.

Floors are pugged to deaden sound. The pugging may be in silicate cotton, as in clause No. 57; or dry pit sand may be employed, but sea sand must never be used. Any of the three classes of floors mentioned may be pugged. Inodorous felt may be tacked over the joists to deaden sound, instead of the ordinary pugging.

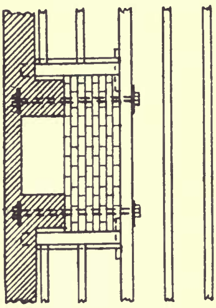


See clauses Nos. 13, 33, and 35 to 37, which may, perhaps, preferably be inserted here. For timber suitable for floor joists, see clauses Nos. 14 and 19.

Trimmers.



(47)—Trim for hearths, landings, trap doors and other openings in floors, with trimmers and trimming joists, 1 in. thicker than the joists they support. The joists are not to be tenoned into the trimmers, but slightly housed in, and supported on $2\frac{1}{2}$ in. × 2 in. deal fillets spiked to the trimmers; and the joists, the trimmers and fillets spiked to one another.



Fireplace trimmers taking a bearing on the walls and running parallel with chimney breasts, to be secured with two $\frac{3}{4}$ in. diameter wrought-iron bolts, nuts, heads, and 4 in. × 4 in. × $\frac{1}{4}$ in. washers; the bolts being carried through the trimmer arches and buried in the walls.

Mortising and tenoning trimmers and joists together weakens the timbers considerably, but on the other hand, when the timbers rest on fillets they depend upon the iron spikes for their support. Joists should be thin and deep for strength, and when plastered on the under side must not be more than $2\frac{1}{2}$ in. thick, unless the edges be taken off, otherwise there will be insufficient key for the plastering.

Distance of joists apart.

(48)—Bridging and ceiling joists to be spaced at 12 in. (13 in. or 14 in.) centres (or not more than 12 in. apart).

Also see clause No. 13.

Strutting.

(49)—Herring-bone strutting to be $2\frac{1}{2}$ in. (or 3 in.) × $1\frac{1}{2}$ in. (or 2 in.), spiked down the full depth of the joists, and spaced every 6 ft. (or 7 ft.) apart.

or,

The solid bridging to be 2 in. (or 3 in.) thick, by the full depth of the joists, and spaced every 6 ft. (or 7 ft.) apart.

Solid bridging stiffens a floor considerably more than herring-bone strutting, but at the same time it adds to the weight. State if ceiling joists are to be strutted, see notes to clause No. 91.

Rise in floors. **(50)**—Floors to be laid with a rise of $\frac{1}{2}$ in. in the centre in a 20 ft. span.

This will allow the floor to "sag" into a horizontal position.

Plates. **(51)**—Wall and pole plates to be halved and dovetailed together at ends, and scarfed at joints.

It is very customary now to employ hoop iron from $1\frac{1}{2}$ in. to 3 in. wide to bed joists upon, instead of wood plates. For the gauges of hoop iron see Bricklayer, clause No. 66.

The following clauses, Nos. 52 and 53, refer to "single-joisted floors."

Basement or ground floors, joists on sleeper walls. **(52)**—The basement (or ground floor) joists to be in 5 in. × 2 in. (or 3 in.) English oak (or fir), with 4 in. (or $4\frac{1}{2}$ in.) × 3 in. oak wall and sleeper plates. (For sketches of sleeper walls see Bricklayer, clause No. 27.)

These are the usual sizes for joists in these positions, as sleeper walls are generally placed about 5 ft. or 6 ft. apart.

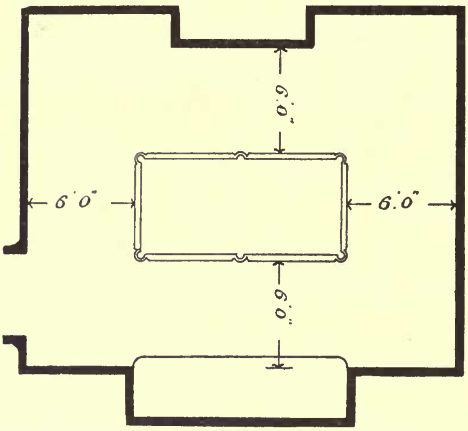
Oak should always be used where the floors are near the ground, and the timber may in addition be charred. No strutting is required with floors supported on sleeper walls.

State if $1\frac{1}{2}$ in. to 3 in. hoop iron, as wall or sleeper plates, be employed in lieu of oak: for gauges of hoop iron see Bricklayer, clause No. 66.

A billiard room may be arranged in any part of a building, as long as it can be lighted from a lantern light immediately over the billiard table; the vertical lights preferably only being glazed; for if the skylight portion of the lantern be glazed, passing clouds are apt to throw a shadow on the table. If a lantern light cannot be obtained, then the room may be lighted from windows placed in the walls on two opposite sides of the room, the sills of the windows being not less than 4 ft. up above the floor level.

The legs of the table should have a solid bearing, either directly upon the ground, or upon beams or girders about 11 in. wide if the billiard room be above the ground level. These beams or girders may run from wall to wall right across the room, both the long and short way of the table, in case it requires shifting at any time.

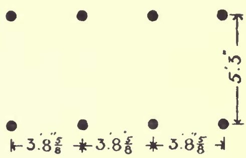
The clear space around the table in every direction, free from all projections, is usually 6 ft.; but if more space can be obtained the better, although the game can be played with a space of only 5 ft. 6 in. In confined situations, sometimes 5 ft. and even only 4 ft. 6 in. can be obtained, but 5 ft. 6 in. should be a least width for any comfort in playing.



Any seats, lounges or divans should be raised up above the general level of the floor, in order to give a better view of the game to onlookers. Of course the seats and lounges should have an additional space allowed them beyond the size of the room necessary for play.

When two or more tables are arranged in one room, 5 ft. will be sufficient for the space between the tables; often it is considerably less. The pockets do not project beyond the edge of a table.

A full-size billiard table is 5 ft. $10\frac{1}{2}$ in. × 11 ft. 9 in. clear of the cushions, and about 6 ft. $7\frac{1}{2}$ in. × 12 ft. 6 in. over all. It has eight legs, spaced apart as shown on sketch.



A three-quarter size billiard table is 4 ft. $10\frac{1}{2}$ in. × 9 ft. 9 in. clear of the cushions, and about 5 ft. $7\frac{1}{2}$ in. × 10 ft. 6 in. over all. It has six legs. Billiard tables are also made in about 9 ft., 8 ft., 7 ft. and 6 ft. inside lengths, by proportionate widths.

The height of a billiard table is 3 ft. to 2 ft. 10 in. from the floor to the top of the cushion.

A billiard room should be lofty, a fair height being 14 ft., and efficient ventilation should be provided, both as regards inlets and outlets. For play at night-time, a six-arm pendant is required.

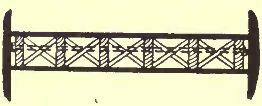
For lantern lights and finishings, see clauses Nos. 124 to 129, especially clause No. 127 with notes. For other forms of skylights, see clauses Nos. 130 to 134a.

For gas and electric light, see Gasfitter and "Electric Lighting," clauses Nos. 8 and 24 respectively.

For cigar light, see Gasfitter, clauses Nos. 8 and 24.

For air inlets and air outlets, see the article on "Ventilation."

1st and 2nd floor joists.



(53)—The first and second floor joists to be in fir timber, with 9 in. × 3 in. joists (or other size according to span).

4 in. (or $4\frac{1}{2}$ in.) × 3 in. wall plates (invariably cut these sizes. For hoop iron wall plates, see notes to clause No. 51).

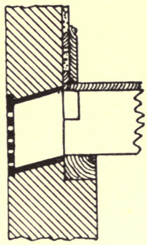
2 in. (or 3 in.) solid bridging, the full depth of joists, and spaced every 6 ft. (or 7 ft.) apart.

or,

$2\frac{1}{2}$ in. × $1\frac{1}{2}$ in. herring-bone strutting, spiked the full depth of joists every 6 ft. (or 7 ft.) apart.

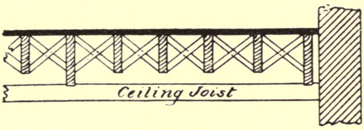
Put $\frac{3}{4}$ in. wrought-iron tension rods, with nuts, heads and 4 in. × 4 in. × $\frac{1}{4}$ in. washers, every 10 ft. apart, carried through all the joists.

Bridging joists should rest $4\frac{1}{2}$ in. on the walls. Bridging joists to upper floors may be ventilated by notching out as shown on sketch. See clause No. 35 for boring joists for ventilation.



Tension rods secure all the joists together, but are not always provided.

In "single floors," the ceilings are apt to crack, when the joists exceed 10 ft. span, but the damage may be minimised by constructing the floors in the following manner:—



The first and second floor joists to be 9 in. × 3 in. in fir timber, with every fourth (3rd or 5th) joist 11 in. × 3 in. (or other sizes according to the spans).

4 in. (or $4\frac{1}{2}$ in.) × 3 in. wall plates (for hoop iron wall plates see notes to clause No. 51).

2 in. (or 3 in.) solid bridging, the full depth of the smaller joists, and spaced every 6 ft. (or 7 ft.) apart.

or,

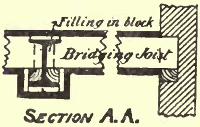
$2\frac{1}{2}$ in. × $1\frac{1}{2}$ in. herring-bone strutting, spiked the full depth of the smaller joists, and spaced every 6 ft. (or 7 ft.) apart.

Put $\frac{3}{4}$ in. wrought-iron tension rods, with nuts, heads, and 4 in. × 4 in. × $\frac{1}{4}$ in. washers, every 10 ft. apart, carried through all the joists.

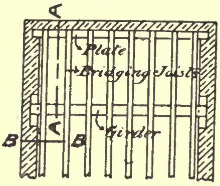
4 in. × 2 in. ceiling joists, notched on to every fifth (3rd or 4th) joist.

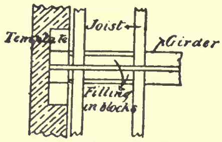
Ceiling joists do not require strutting.

A "single floor" may be constructed over a large room in this manner:—



SECTION A.A.





DETAIL B.B.

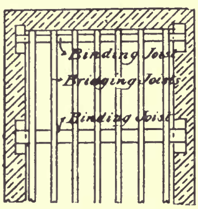
The floor to reception room (or other large room) to be formed with two 12 in. × 6 in. rolled iron (or steel) joists, resting on 2 ft. 6 in. × 9 in. × 3 in. tooled York templates, with 3 in. × 2 in. fir fillets bolted on each side of the joists with ½ in. bolts, nuts, heads and washers every 4 ft. apart.

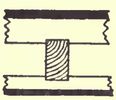
The bridging joists to be 9 in. × 3 in. with 9 in. × 2 in. (or 3 in.) solid bridgings spaced every 6 ft. (or 7 ft.) apart, and 2 in. solid bridging blocks placed between the bridging joists on each side of the iron (or steel) joists, where the bridging joists fit against them. Wall plates to be 4 in. (or 4½ in.) × 3 in. (for hoop iron as wall plates see notes to clause No. 51). Bracket round the girders for plastering (or for deal casing).

Fill in the correct sizes of the iron or steel and timber joists, according to the spans and loads. The stone templates, wood fillets, plates and iron bolts would remain practically the same in any case. Ceiling joists may be provided to this floor, in the same way as in the preceding example, by making every fourth (3rd or 5th) bridging joist deeper.

(54)—

A double floor.





(55)—The first and second floors to be constructed in fir timber with :—

9 in. × 3 in. bridging joists, notched on to the binding joists.

12 in. × 9 in. binding joists, spaced 6 ft. apart with 12 in. × 4½ in. binding joists against the walls; the ends being cased in cast-iron shoes, 9 in. long, ½ in. metal, and fixed on 2 ft. 6 in. × 9 in. × 3 in. tooled York templates.

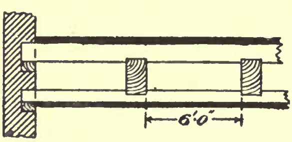
4 in. × 2 in. ceiling joists, notched to the binding joists (fill in the correct size of the binding joists according to the span).

If the bridging joists are built into the walls, the walls will be the better tied together.

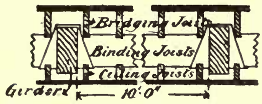
Binding joists should rest 9 in. on the walls, and are generally spaced 6 ft. apart.

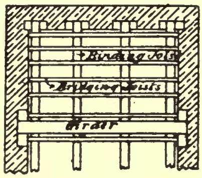
No solid bridging or herring-bone strutting is absolutely required in this class of floor, the binders practically acting in their place.

The half binding joists against the walls may be omitted, and in that case the bridging and ceiling joists would both require 4 in. (or 4½ in.) × 3 in. fir wall plates (or else hoop iron as wall plates, as in notes to clause No. 51). When a first-class ceiling is required, a "double floor" is absolutely necessary, even if the span be small.



Framed floors.





(56)—The first and second floors to be constructed in fir timber with:—

9 in. × 3 in. bridging joists, notched on to the binding joists.

12 in. × 9 in. binding joists, spaced 6 ft. apart, with 12 in. × 4½ in. binding joists against the walls, the ends resting on the walls being cased in cast-iron shoes 9 in. long, ½ in. metal, on 2 ft. 6 in. × 9 in. × 3 in. tooled York templates, and the ends supported by the girders being fixed to ½ in. metal cast-iron stirrups, bolted to the girders with ½ in. bolts, nuts and heads.

18 in. × 12 in. girders, spaced every 10 ft. apart, the ends being cased in cast-iron shoes 12 in. long, ¾ in. metal, and resting on 3 ft. × 12 in. × 6 in. tooled York templates.

4 in. by 2 in. ceiling joists, notched to the binders.

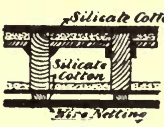
No solid bridging or herring-bone strutting is absolutely required in this class of floor, the binders practically acting in their place.

The binding joists against the walls may be omitted, and in that case 4 in. (or 4½ in.) × 3 in. wall plates must be taken, both to the bridging and ceiling joists (or the hoop iron wall plates, as in notes to clause No. 51).

Girders should rest 12 in. on the walls, and are generally spaced 10 ft. apart, and where the span exceeds about 22 ft. they should be trussed.

"Framed floors," as described in this clause, are now almost out of date, iron or steel being used in place. Fill in the correct sizes of the girders.

Fire- and sound-resisting timber floors.



(57)—All floors (whether "single," "double" or "framed") above those on the ground level to be treated in the following manner; both as a preventive of sound and as a precaution against fire: Cover over on the under side of floor (or ceiling) joists with galvanised iron wire netting ¾ in. (or ½ in.) mesh, fixed to the joists with wire U hooks, and fill in above 1 in. (or 1½ in.) deep, with English made silicate cotton (or 1 in. or 1½ in. English made silicate felt), and then spike 2 in. × 1 in. fir battens along the under side of joists for the plaster. Fix to the upper part of joists 1¼ in. × 1 in. fillets (or angle fillets, two out of 2 in. × 1¼ in.), and lay ¾ in. (or 1 in.) rough deal boarding between, kept 1 in. (or 1½ in.) below the under side of floor boards, and fill up level to the top of joists with 1 in. (or 1½ in.) silicate cotton (or silicate felt).

Treating a floor in this manner will, of course, not make it fire-proof, it merely being employed as a preventive against fire.

The lower layer of silicate cotton (or silicate felt) acts as a fire- and sound-resisting material from the room below, and the upper layer is a fire- and sound-resisting material from the room above. The battens on the under side of the joists are required for obtaining a better key for the plastering.

Sound boarding is a name given to the rough boarding between the joists.

For concrete fire-resisting floors see clauses Nos. 40, 41, 43 and 44 under Excavator.

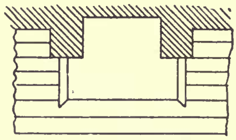
Flooring.

(Clauses Nos. 58 to 73.)

Generally. **(58)**—All floorboards to be in long lengths, and first temporarily fixed in position for six (or nine) months; then taken up, reshot, relaid and joints smoothed over. In all cases hard wood flooring is to be side nailed, and then traversed, smoothed and scraped over. Wood block flooring to be traversed and smoothed over.

Clauses Nos. 11, 16, 19 and 23 may perhaps be inserted here. See clause No. 4 under Pavior, for wood block flooring.

Mitred borders. **(59)**—Put 1 in. ($\frac{3}{4}$ in., $1\frac{1}{4}$ in., or $1\frac{1}{2}$ in.) × 4 in. glued and mitred borders to hearths, landings, trap doors, lifts, and around other openings, and where flooring finishes against other material.



Spaces between openings. **(60)**—The flooring to spaces between door and other openings to be fixed on 3 in. × 2 in. bearers, 12 in. apart.

Iron tongues. **(61)**—Iron tongues to floorings to be kept down two-thirds the thickness of the boards.

Hoop iron tongued 1 in. deal flooring should have 1 in. galvanised iron tongues, No. 18 gauge.

Hoop iron tongued $1\frac{1}{4}$ in. deal flooring should have $1\frac{1}{8}$ in. galvanised iron tongues, No. 17 gauge.

Hoop iron tongued $1\frac{1}{2}$ in. deal flooring should have $1\frac{1}{4}$ in. galvanised iron tongues, No. 16 gauge.

Hoop iron tongued 2 in. deal flooring should have $1\frac{3}{8}$ in. galvanised iron tongues, No. 15 gauge.

Hoop iron tongued $2\frac{1}{2}$ in. or 3 in. deal flooring should have $1\frac{1}{2}$ in. galvanised iron tongues, No. 15 gauge.

Iron tongues when not galvanised, may be either plain, or else payed over with two coats of red lead. See Bricklayer, notes to clause No. 66, for other sizes of hoop iron. Flooring is seldom thicker than $1\frac{1}{2}$ in.

Nails. **(62)**—$\frac{3}{4}$ in. deal flooring to be fixed with nails weighing 10 lbs. per 1000.

1 in. deal flooring to be fixed with nails weighing 12 lbs. per 1000.

$1\frac{1}{4}$ in. deal flooring to be fixed with nails weighing 18 lbs. per 1000.

$1\frac{1}{2}$ in. deal flooring to be fixed with nails weighing 25 lbs. per 1000.

2 in. deal flooring to be fixed with nails weighing 32 lbs. per 1000.

$2\frac{1}{2}$ in. deal flooring to be fixed with nails weighing 40 lbs. per 1000.

3 in. deal flooring to be fixed with nails weighing 80 lbs. per 1000.

1 in. oak flooring to be fixed with nails weighing 20 lbs. per 1000.

$1\frac{1}{4}$ in. oak flooring to be fixed with nails weighing 28 lbs. per 1000.

$1\frac{1}{2}$ in. oak flooring to be fixed with nails weighing 36 lbs. per 1000.

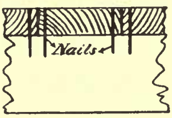
2 in. oak flooring to be fixed with nails weighing 50 lbs. per 1000.

$2\frac{1}{2}$ in. oak flooring to be fixed with nails weighing 70 lbs. per 1000.

3 in. oak flooring to be fixed with nails weighing 90 lbs. per 1000.

Flooring to servants' offices and other ordinary floors.

(63)—Cover the floors and passages to servants' offices with plain jointed 1 in. (or $1\frac{1}{4}$ in.) wrought yellow Gefle deal in batten widths, laid folding, straight-jointed and with square (splayed or tongued) headings breaking joint.



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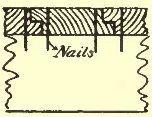
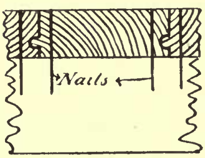


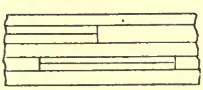
With rebated (fillistered) 1 in. (or $1\frac{1}{4}$ in.) wrought yellow Gefle deal in batten widths, laid straight-jointed, with square (or splayed) headings breaking joint.

or,



With grooved and tongued 1 in. (or $1\frac{1}{4}$ in.) wrought yellow Gefle deal in batten widths, laid straight-jointed, with square (or splayed) headings breaking joint.

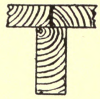
These three descriptions are the commonest kinds of flooring suitable for private houses; the first being that mostly used for servants' offices, basement, ground and upper floors. The upper floors are sometimes laid in "Swedish imported white deal," see clause No. 16.

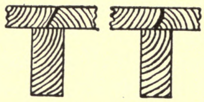


Straight-jointed flooring is when the boards are all cut to one parallel width; when they are in various widths they are broken jointed, see sketch.

The disadvantage of a plain joint to flooring, such as that described in the first paragraph above, is that the shrinkage of the joints allows dirt and dust to accumulate on the ceiling below.

See clause No. 16 for other kinds of deal for flooring.

A square heading is thus, 

A splayed heading thus, 

And a tongued heading thus. 

Ceiling joists immediately under the roof may be boarded over to form a store space for boxes, in :—

$\frac{3}{4}$ in., 1 in. or $1\frac{1}{4}$ in. rough spruce deal, edges shot, in batten (deal or plank) widths, plain jointed, laid folding, with straight (or broken) joints and square headings.

$\frac{3}{4}$ in., 1 in. or $1\frac{1}{4}$ in. rough white deal, edges shot, in batten (deal or plank) widths, plain jointed, laid folding, with straight (or broken) joints and square headings.

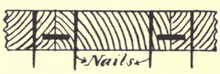
$\frac{3}{4}$ in., 1 in. or $1\frac{1}{4}$ in. rough yellow deal, edges shot, in batten (deal or plank) widths, plain jointed, laid folding, with straight (or broken) joints and square headings.

or,

The flooring in this position may be in plain flooring, as described in the first paragraph under this clause.

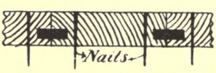
Ground and upper floors.

(64)—Cover the floors of best rooms on ground floor (state which rooms) and all the rooms on first and second floors, together with all passages and landings, with ploughed and tongued $1\frac{1}{4}$ in. (or 1 in.) wrought yellow Gefle deal in batten widths, laid straight jointed, with squared (splayed or tongued) headings breaking joint, and $1\frac{1}{8}$ in. No. 17 gauge galvanised hoop iron tongues (or 1 in. No. 18 gauge for 1 in. flooring). Cut down joists in vestibule 2 in., and form a 3 ft. × 2 ft. 6 in. boarded mat space with a 3 in. × 2 in. mitred border round, and provide a door mat (say) p.c. 15s.



See clause No. 16 for other kinds of deal for flooring. See clause No. 61 for iron tongues.

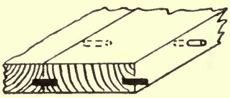
This class of flooring is suitable for ordinary good work. It may also be laid with 1 in. × $\frac{3}{16}$ in. cross-tongued oak in lieu of iron tongues.



See Pavior, clause No. 2, for a mat space in a paved vestibule.

Floors to best reception rooms.

(**65**)—Cover the floors of (say) dining and drawing rooms with $1\frac{1}{4}$ in. wrought yellow Archangel deal in half batten ($3\frac{1}{2}$ in.) widths (or in $4\frac{1}{2}$ in. or $5\frac{1}{2}$ in. widths), laid straight jointed, with square (splayed, dowelled or tongued) headings breaking joint, and dowelled together at joints with $1\frac{1}{4}$ in. $\times \frac{1}{4}$ in. oak dowels, 12 in. apart, and side nailed to joists with French nails.



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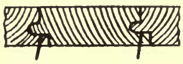


Cover the floors of (say) dining and drawing rooms with rebated, grooved and tongued $1\frac{1}{4}$ in. wrought yellow Archangel deal in half batten widths, laid straight jointed, with square (or splayed) headings breaking joint, and side nailed to joists with French nails.

Dowelled floors, and rebated grooved and tongued floors, are used in the very best work. In hard woods, such as oak, pitch pine and teak, they may be as little as 1 in. thick, but hard wood floors are generally laid upon counter flooring, as in clause No. 67.

$3\frac{1}{2}$ in. widths are half battens; see notes under clause No. 4 for the size of battens.

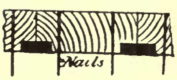
$4\frac{1}{2}$ in. widths are half deals; see notes under clause No. 4 for the size of deals.

$5\frac{1}{2}$ in. widths are half planks; see notes under clause No. 4 for the size of planks.

The smaller the width of flooring, the less will be the shrinkage, especially in pitch pine.

A description for the class of joint, as sketch, would be the same as the second paragraph under this clause, except it may be described as "rebated," skew grooved and tongued. White deal is never laid with these special joints, but always with a plain joint.

Warehouse and shop floors.



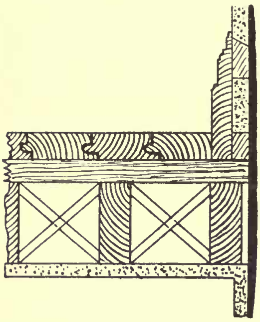
(**66**)—Cover the warehouse and shop floors with rebated and filleted $1\frac{1}{4}$ in. wrought yellow Gefle deal in batten widths, laid straight jointed on 1 in. $\times \frac{3}{8}$ in. deal (or 1 in. $\times \frac{1}{4}$ in. oak), cross tongued fillets, with square (splayed or filleted) headings breaking joint.

Flooring 1 in. thick is too thin for this class of joint, $1\frac{1}{2}$ in. and 2 in. being often used. Warehouses, shops, public bars and places subject to much wear, should never have flooring less than $1\frac{1}{4}$ in. thick, $1\frac{1}{2}$ in. being preferable as a least thickness. Warehouse floors may also be laid as clause No. 63; or else in rough deal, with edges shot in a similar way to clause No. 63; they are also laid as clause No. 64, modified to $1\frac{1}{4}$ in., $1\frac{1}{2}$ in. or 2 in. thicknesses. Shops, public bars and such places may also be laid as clauses Nos. 63 or 64, modified to $1\frac{1}{4}$ in., $1\frac{1}{2}$ in. or 2 in. thicknesses.

It is a good plan to raise the flooring at the back of counters to shops and public bars, as it gives the attendants more command.

Double flooring to reception rooms.

(67)—Cover the floors of (say) dining, drawing and dancing rooms with plain-jointed 1 in. (or $1\frac{1}{4}$ in.) wrought (or rough with edges shot) yellow Gefle deal counter flooring, in batten (or half batten) widths, laid folding, with straight joints, and square (or splayed) headings breaking joint. Lay the upper flooring with rebated, grooved and tongued (or rebated, skew grooved and tongued) 1 in. (or $1\frac{1}{4}$ in.) wrought Austrian Trieste oak (or Hungarian Fiume oak, or Russian Riga oak, or Dantzic Crown Memel oak, or Wainscot oak, or Moulmein or Rangoon teak, or American pitch pine), in $4\frac{1}{2}$ in. (3 in., $3\frac{1}{2}$ in., 4 in., 5 in. or $5\frac{1}{2}$ in.) widths, laid straight jointed, with square or splayed headings breaking joint, and side nailed to the counter flooring with French nails. Traverse, smooth and scrape over at completion, and French (or wax) polish. The upper flooring is to be scribed up against the skirting.



An oak floor looks better if the boards be laid the long way of the room.

Only when floors are polished they require to be scraped over. Floors for dancing are only wax polished.

The upper flooring may be dowelled as in clause No. 65, instead of being rebated, grooved and tongued.

One inch counter flooring is the least thickness suitable for taking the nails of the upper flooring.

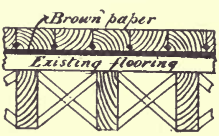
Hard wood upper flooring may be laid $\frac{3}{4}$ in. thick if it be plain jointed as in the first paragraph of clause No. 63, but in any case it should be side nailed to the counter flooring. The deal counter flooring should in this case be either as the second or third paragraphs under clause No. 63, or as clause No. 64, or as the second paragraph under clause No. 65, or as clause No. 66, so as to prevent any dirt finding its way through to the ceiling below. Where space is an object hard wood flooring may be laid immediately on the joists without the counter flooring, but it does not make so good a floor.

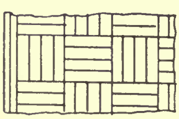
Wood block floors.

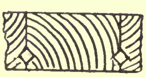
(68)—See notes to, and clause No. 4 under Pavior, which should perhaps come more properly here.

Wood block floor laid on an existing floor.

(69)—Plain over the joints of the existing flooring in warehouse to an even face, and glue down thick brown paper over the whole surface. Lay 12 in. × 3 in. × $1\frac{3}{4}$ in. (or 2 in.) cut and skew grooved, solid, wrought all round, yellow Gefle deal wood block flooring, in squares (or herring-bone), with a margin round, two (or one) blocks wide. The blocks to be dipped half-way up in hot liquid tar and pitch composition, in the proportion of two parts tar to one of pitch, and when set, traversed and smoothed over. (If wood blocks are laid in longer lengths than 12 in. they are liable to work up; 9 in. is about the best length. In like manner, if they be too thin they are also liable to spring.)

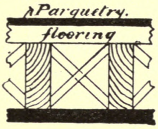


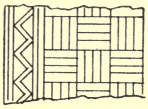




See notes under clause No. 4 in Pavior.

Parquet flooring.





(**70**)—Level down, plane over and cover (say) drawing room floor with veneered oak parquetry to pattern $\frac{1}{4}$ in. (or $\frac{1}{2}$ in.) thick, with an 18 in. border round, and canvassed over on the back, of the p.c. value 2s. (or other price) per foot super., and the whole laid in prepared glue, French nailed, cleaned off, and French (or wax) polished.

The flooring under the parquetry must be perfectly dry and seasoned, otherwise, owing to any shrinkage in the flooring, the parquetry is liable to crack.

Veneered parquet flooring must be laid on a perfectly level counter (under) flooring. If the floor be out of level, the boards must be taken up, and the joists furred up to a level, and the boards relaid and planed over. Parquet floors may be in any hard wood, and to any design. They are generally in hard woods.

Sometimes deal floors are laid with a parquet border only, the flooring then immediately under the parquetry must either be rebated out to take the extra thickness of the parquet, or else a lesser thickness of floorboard must be used under the border. Give the width of border.

The deal flooring under parquetry may be of any of the descriptions mentioned in clauses Nos. 63 to 66.

See notes to clause No. 67, on polishing.

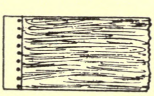
Solid Parquetry.

(**71**)—Solid parquet flooring is generally 1 in. thick, and may be either in soft or hard woods. It is laid to a pattern in precisely the same way as clause No. 70, and may be similarly described.

Carpet steps.

(**72**)—Put to all doorways, the full size of opening, $\frac{3}{4}$ in. pitch pine (or oak) carpet steps, bevelled and rounded off on both edges.

Matting.



(**73**)—Lay bordered cocoa matting to passages (or aisles) 36 in. wide, with ends carefully leaded and riveted on with copper rivets.

Roofs, Flats, Domes amd Skylights.

(Clauses Nos. 74 to 134A.)

The following list gives the weights of various roof coverings per square:—

A square is 100 superficial feet.

Large slates weigh about 900 to 1100 lbs. per square.
Ordinary slates weigh about 550 to 700 lbs. per square.
Small slates weigh about 450 to 600 lbs. per square.
Stone tiles weigh about 2380 lbs. per square.
Plain tiles, including laths and absorbed rain, weigh about 1800 lbs. per square.
Pan tiles, including laths and absorbed rain, weigh about 1200 lbs. per square.
Straw thatch, with battens, weighs about 650 lbs. per square.
Milled sheet lead, including laps, weighs about 550 to 850 lbs. per square.
Zinc, 14 to 16 gauge, weighs about 150 to 175 lbs. per square.
Corrugated iron, 16 B.W.G., weighs about 350 lbs. per square.
Sheet iron, 16 B.W.G., weighs about 250 lbs. per square.
Copper weighs about 80 to 120 lbs. per square.
Asphalted felt weighs about 30 to 40 lbs. per square.
Boarding, 1 in. thick, weighs about 350 lbs. per square.

For weights of various timber see notes preceding clause No. 46.
In addition to these weights, the pressure of the wind and the weight of snow has to be considered, which may be taken at from 2500 to 5000 lbs. per square for wind, according to the pitch of roof, and 500 lbs. per square for snow.

The pitch for roofs will be found under the several materials suitable for roof coverings; see Slater, clauses Nos. 4 and 5; Tiler, clauses Nos. 1, 2 and 11; Thatcher, clauses Nos. 1 and 2; Stone Tiler, clauses Nos. 1 and 2; Shingler, clause No. 1; Plumber, clause No. 7; Zinc Worker, clauses Nos. 1 and 2; Coppersmith, clause No. 1; and Smith, clauses Nos. 32 and 33.

A King Post roof is suitable for spans from 18 ft. to 30 ft.
A Queen Post „ „ „ „ 30 ft. to 45 ft.
A Queen & Princess roof „ „ „ 45 ft. to 60 ft.

Straps. (**74**)—The straps to be of wrought forged iron, dipped in linseed oil whilst hot, and painted two coats in oil colour when fixed. The holes for bolts to be drillled (or punched) out.

Also see clause No. 75; and Smith, clauses Nos. 7 and 19, for straps.

Roofing spikes,	5 in.	long,	weigh	about	10 lbs.	per	100
„	„	6 in.	„	„	„	20 lbs.	„	„
„	„	7 in.	„	„	„	30 lbs.	„	„
„	„	8 in.	„	„	„	45 lbs.	„	„
„	„	9 in.	„	„	„	60 lbs.	„	„

See clauses Nos. 13 and 37, which may perhaps be inserted here.

The sizes of the scantlings, suitable for different spans of the various classes of roof trusses, may be obtained from any of the Architects' memorandum books.

Roof trusses, of whatever description, are generally placed 10 ft. apart. Purlins may be notched out on the upper side, but not on the under side; they should be placed not more than 8 ft. apart.

Tie beams should be supported every 12 to 14 ft. in their length, either by a king post, queen posts or princesses.

King Post Roof.

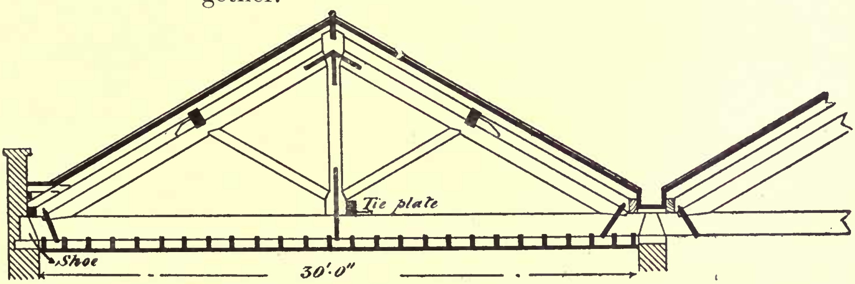
(Suitable for spans up to 30 ft.)

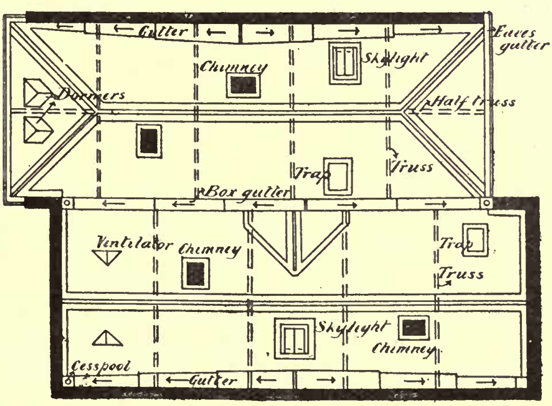
(Clauses Nos. 74 to 99.)

The following example is for a king post roof truss, 30 ft. span, covered with slates. If tiles or stone tiles be used, the common rafters and purlins should be made one-third and one-half stronger respectively.

King post truss (30 ft. span).

(75)—The main roof to be composed of (say) eight whole trusses placed 10 ft. apart, and (say) two half trusses, each being formed of the following scantlings, and the whole notched, framed, spiked and strapped together.



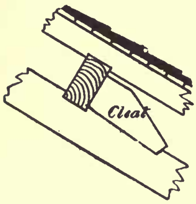


Tie beams 12 in. × 6 in. having a rise of $\frac{3}{4}$ in. at the centre, with ends cased in cast-iron shoes 10 in. long, $\frac{5}{8}$ in. metal, resting 9 in. on walls at either end, with tarred felt (or 4 lb. lead) seatings, on 2 ft. 6 in. × 12 in. × 3 in. tooled York templates.

King posts out of 6 in. × 5 in.

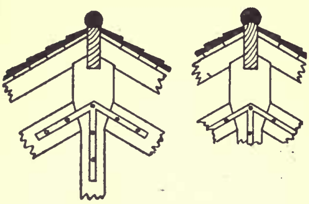
Principal rafters 6 in. × 4 in.

Struts (braces) $4\frac{1}{2}$ in. × 3 in.



Purlins 9 in. × 6 in. scarfed (or butted with oak keys and wedges) at joints, fixed 6 in. in at wall ends on 9 in. × 9 in. × 3 in. tooled York templates, with 4 in. × 4 in. struts at the junction of purlins with hips.

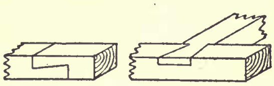
Cleats 6 in. × 4 in. × 2 ft. 0 in. long.



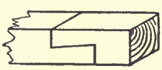
Ridges 11 in. × $1\frac{1}{2}$ in. (or 2 in.) scarfed at joints (state if twice splayed on top for roll).

Hip rafters 11 in. × 2 in. (state if twice splayed on top for roll).

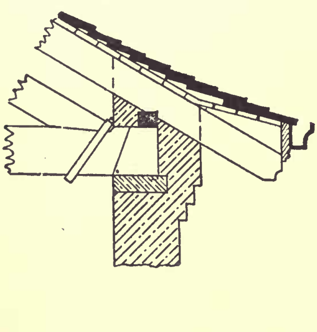
Valley rafters 11 in. × 2 in. (state if bird's-mouthed out).



Pole plates 6 in. × 3 in. (varies in height according to position in which it is placed) and $4\frac{1}{2}$ in. (or 4 in.) × 3 in. wall plates in long lengths, scarfed at joints, and halved and dovetailed at angles.



Tie plates 6 in. × 3 in. in long lengths, scarfed at joints.



Common and jack rafters $4\frac{1}{2}$ in. × 2 in. (or $2\frac{1}{2}$ in.) with cut wrought ends at overhanging eaves, and wrought sprocket (cock) pieces, each 2 ft. long out of 6 in. × 2 in. (or $2\frac{1}{2}$ in.) Trim for skylights, dormers, chimney stacks, trap doors and ventilators.

Dragon pieces and angle brace ties $4\frac{1}{2}$ in. × 4 in.

Straps $1\frac{1}{2}$ in. (or 2 in.) × $\frac{3}{16}$ in. (or $\frac{1}{4}$ in.) wrought forged iron, placed on both sides of the timbers, with $\frac{1}{2}$ in. bolts, nuts, heads, washers, jibs and cotters. (See Smith, clauses Nos. 7 and 19.)

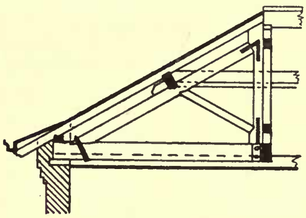
In some cases it is a great assistance to the rigidity of roof trusses to tie them together with a horizontal tie plate, say 6 in. × 3 in., running along the tie beams next the king posts, but when ceiling joists are notched to the tie beams this tie plate is not required.

The scantlings given are the least sizes suitable for this roof truss, but a neater and stronger truss is obtained by making the king post, the principal rafters, and the struts (braces), the same thickness as the tie beam, the straps will then all fix level. At the same time, it is perhaps somewhat a waste of material.

If trusses be placed more than 10 ft. apart, the timbers must be made of larger scantlings.

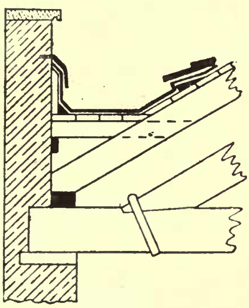
If a cross wall run up to the slating so as to catch the purlins, a truss at that point will not be required.

Half trusses.



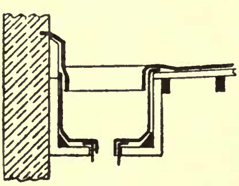
(**76**)—The tie beams to the half trusses to be secured to the tie beams of the whole trusses with $\frac{1}{2}$ in. wrought-iron angle plates, 6 in. wide, with $\frac{1}{2}$ in. bolts, nuts, heads and washers (or else fixed into cast-iron shoes bolted on).

Wall gutters.



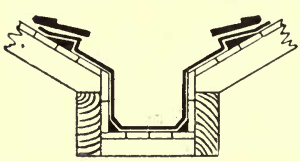
(**77**)—The gutters against walls to be not less than 9 in. (or 12 in.) in width in the narrowest part, and formed with 1 in. (or $1\frac{1}{4}$ in.) rough deal gutter boarding, and framed bearers on fillet pieces plugged to walls, and laid to falls of 2 in. in 8 ft., with 2 in. (or $1\frac{1}{2}$ in.) cross rebated drips, 1 in. splayed (feather-edged) flashing boards, and $1\frac{1}{2}$ in. angle tilting fillets. Form small gutters round the skylights, chimney stacks, dormers and trap doors in a similar manner.

Cesspools.



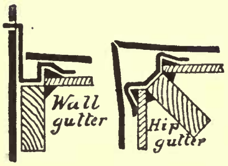
(**78**)—To be $1\frac{1}{4}$ in. wrought deal dovetailed cesspools 9 in. × 9 in. × 9 in. (or 12 in. × 12 in. × 12 in.) in the clear, with perforation for outlet pipe, and $1\frac{1}{2}$ in. angle tilting fillets.

Box gutter and cesspools.



(**79**)—The box gutter to be 12 in. (to 18 in.) wide, with kerbs (gutter plates) 3 in. thick, and formed with similar gutter boarding, bearers, drips, cesspools and tilting fillets as to the wall gutters. (See clause No. 77.)

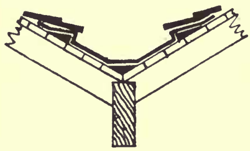
Secret gutters.



(80)—Form secret gutters 2 in. wide on fillet pieces at mitres of roof planes with hips, and against walls, chimney stacks, skylights, dormers and trap doors 3 in. wide, and with tilting fillets.

Also see clause No. 11 under Plumber. In secret gutters no hip rolls are required, as the slates mitre up close.

Valley boards.



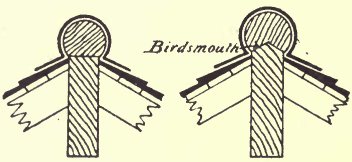
(81)—To be 1 in. (or $\frac{3}{4}$ in.) rough deal valley boards, splayed together, with $1\frac{1}{2}$ in. angle tilting fillet at the junction.

Tilting fillets.

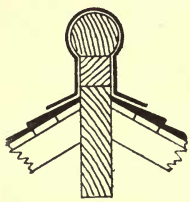
(82)—Put 4 in. × $1\frac{1}{2}$ in. splayed angle tilting fillets to all eaves, valleys, and to all parts where slates abut against walls, chimney stacks, dormers, skylights and trap doors.

Hip and ridge rolls.

(83)—To be 2 in. × 2 in. rounded deal (state if bird's-mouthed).



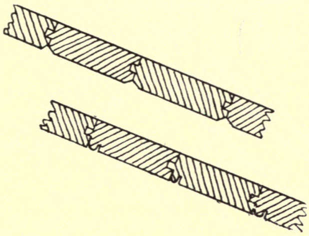
For greater effect, the hip and ridge rolls are sometimes made larger, as 3 in. × 3 in. or 4 in. × 4 in., and kept up with a furring piece placed on top of the hip or ridge. But if the hip and ridge be deep enough this effect will be obtained without the addition of the furring piece.



Roof boarding, felt and battens.

(84)—Cover roofs with 1 in. (or $\frac{3}{4}$ in.) rough deal boarding, edges shot, laid with horizontal joints (or diagonal), with $\frac{1}{8}$ in. thick asphalted roofing felt over, properly passed, lapped, and tacked on every 3 in. apart with $\frac{1}{8}$ in. clout nails, 5 lbs. per 1000 (or 1 in. copper nails). Lay $2\frac{1}{2}$ in. × $\frac{3}{4}$ in. horizontal fir battens for slates laid to a 3 in. lap, spiked on to $2\frac{1}{2}$ in. × $\frac{3}{4}$ in. fir battening running from ridge to eaves, spaced 12 in. apart, and spiked through to the boarding.

Also see clauses Nos. 5, 6 and 8 under Slater, with notes. The boarding may be iron-tongued, see clause No. 61.



If roof timbers are to show inside a building, then they may be wrought all round. They may also be stop chamfered. The roof boarding should be wrought one side, either with V-jointed, grooved and tongued joints, or matched and beaded joints.

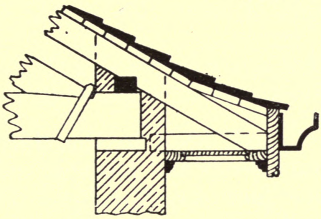
For tile battens see Tiler, clause No. 2; stone tile battens, see Stone Tiler, clause No. 1; and thatch battens, see Thatcher, clause No. 1.

Fascia (eaves board).

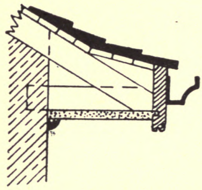
(85)—To be $1\frac{1}{4}$ in. wrought deal beaded eaves-board (fascia), screwed on to end of rafters.

Eaves soffit.

(86)—The eaves soffit to be filled in with $1\frac{1}{4}$ in. moulded panelling fixed to bearers, with a small moulding against wall and fascia.

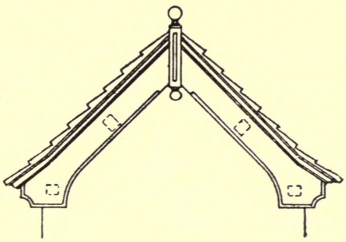


The eaves soffit may be in plain wrought V-jointed boarding, or else it may be lathed and plastered with a moulding against wall, and a groove in the eaves-board (fascia). See Plasterer, clause No. 65.

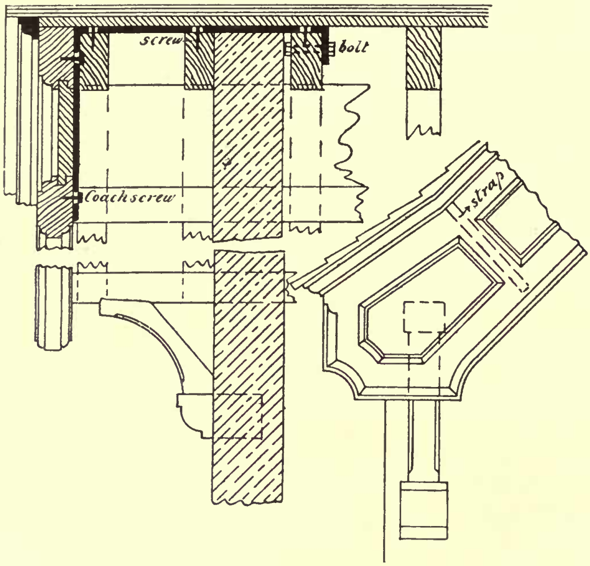


Barge board and moulding.

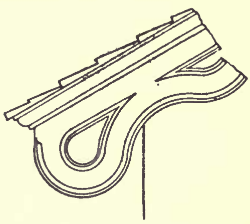
(87)—To be 9 in. × $1\frac{1}{2}$ in. (or 2 in.) wrought all round, with cut shaped ends, staff beaded (chamfered or moulded) on edge, screwed to rafters, and finished with a $2\frac{1}{2}$ in. × $1\frac{1}{2}$ in. moulding under slating. The rafters, purlins, wall plates and boarding to be wrought where exposed to view.



The barge may be formed with solid moulded panelled framing say 2 in. ($2\frac{1}{2}$ in. or 3 in.) thick, secured to the roof timbers with 2 in. × $\frac{3}{8}$ in. wrought-iron angle straps every 3 ft. apart the full depth of barge, screwed on with $2\frac{1}{2}$ in. (or 3 in.) coach-headed screws, and running along the



roof timbers so as to catch three rafters, clipped down to the third rafter, and bolted through with $\frac{3}{8}$ in. bolts, nuts, heads and washers, and

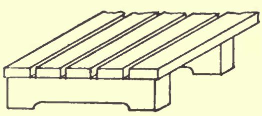


screwed on to the upper face of each rafter with 3 in. screws. State if barges be cut to an ornamental shape, and if perforated. State if the wall plates be supported on stone corbels and wrought framed timber brackets, giving the size of the corbels and timbers.

Finial pendant. (88)—The finial to be 4 in. × 4 in., wrought and stop chamfered, with turned head and console.

The finials may be panelled and ornamental.

Snow boards. (89)—Put snow boards to all gutters where up to 3 ft. in width, in separate 6 ft. (4 ft. or 5 ft.) lengths, formed with 3 in. (or 4 in.) × 1 in. (or $1\frac{1}{2}$ in.) wrought fir laths spaced $\frac{3}{4}$ in. (or 1 in.) apart, and fixed to three 4 in. (3 in. or 5 in.) × 2 in. wrought cut bearers to each 6 ft. length, and painted four coats in oil paint.

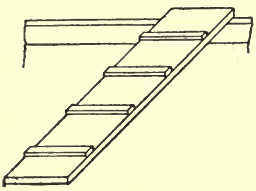


Snow boards prevent the melting snow finding its way into the roof, and allow the water to run away freely along the gutters.

For snow guards to eaves of roofs, see Smith, clause No. 30, with notes.

Duck (cat or roof) ladders.

(**90**)—There are to be two movable roof ladders, formed of $1\frac{1}{4}$ in. boarding 9 in. wide, with $2\frac{1}{2}$ in. $\times$ $1\frac{1}{2}$ in. fillets spiked on every 12 in. apart, and painted four coats in oil colour.

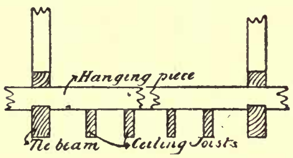


Roof ladders are useful for getting from one pitched roof to another. They may be in rod iron, with a fixing to the roof, but are not so easy to climb, although more durable. For step ladders to trap doors, see clause No. 276a.

Ceiling joists to roof.

(**91**)—Notch and spike to tie beams 5 in. $\times$ 2 in. ceiling joists with 4 in. (or $4\frac{1}{2}$ in.) $\times$ 3 in. wall plates, and lay 1 in. (or $\frac{3}{4}$ in.) rough deal boarding on top over the entire surface.

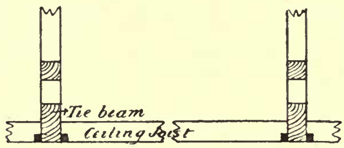
This boarding keeps the dirt away from the plaster ceiling, and adds to the warmth of the rooms below.



The ceiling joists may run parallel with the tie beam from wall to wall if made strong enough, either with or without a hanging piece.

If the roof space is to serve as a box room, or store, then the joists, strutting and flooring would be the same as to floors, see notes and clauses Nos. 46 to 51, 53, 55 to 57, and 58 to 64; and see notes preceding clause No. 46.

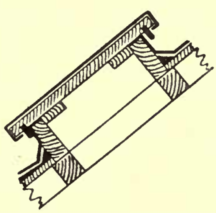
The ceiling joists may also be fixed between the tie beams, notched to $2\frac{1}{2}$ in. $\times$ 2 in. fillets spiked on. If under these circumstances they are to serve as floor joists, then the tie beams must be sufficiently strong to carry this extra weight; the tie beams in this case acting as girders.



When ceiling joists are of some considerable span, they are the better for being strutted between; see clause No. 49.

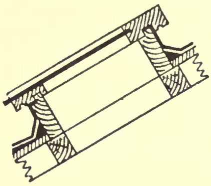
Trap door covered with lead.

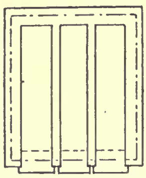
(**92**)—Trim for trap opening 2 ft. $\times$ 1 ft. 9 in. in the clear, and form up with 2 in. rough deal kerb wrought one edge, and standing 6 in. above slating, with $1\frac{1}{2}$ in. angle tilting fillets round sides, and small gutter at top. The door to be $1\frac{1}{4}$ in. matched and beaded boarding, with two $4\frac{1}{2}$ in. $\times$ $1\frac{1}{4}$ in. wrought ledges, and an $1\frac{1}{2}$ in. $\times$ $\frac{3}{4}$ in. fillet grooved into door all round. Cover trap with 5 lb. lead taken round the edges to the under side, and copper nailed every 1 in. apart. Hang door on 4 in. wrought-iron broad butts, and fasten with two 9 in. barrel bolts.



Sheet copper is very suitable for trap doors, as it is very light. For glazed trap door, see clause No. 93. For trap door in ceilings and floors, see clauses Nos. 276a and 276 respectively.

Glazed trap-door skylight.





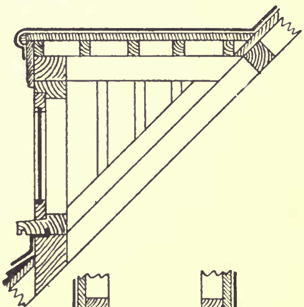
(93)—Trim for trap opening 2 ft. × 1 ft. 9 in. in the clear, form up with 2 in. rough deal rebated kerb, standing 6 in. above slating, with $1\frac{1}{2}$ in. angle tilting fillets round sides, and small gutter at top. The glazed door to be 2 in. (or $1\frac{1}{2}$ in.) wrought, rebated, grooved and throated framing, with two $1\frac{1}{2}$ in. wrought, twice rebated bars, and glazed with $\frac{1}{8}$ in. rolled close ribbed plate in putty, sprigged, and secured at the lower edge with copper clips. Hang door on 4 in. wrought-iron broad butts, and fasten with two 9 in. iron barrel bolts.

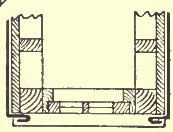
If this trap door show in a room below, 1 in. wrought, beaded and grooved linings would be required round as a finish, with perhaps a skylight opener, p.c. 3s.

For lead-covered trap doors, see clause No. 92. For trap doors in floors and ceilings, see clauses Nos. 276a and 276 respectively. For other forms of skylights in roof planes, see notes to clause No. 130.

Dormer door access to roof.

(94)—Trim for a clear opening 2 ft. 6 in. wide by a sufficient height to allow for a door 4 ft. high, form up sides with 4 in. × 2 in. studs, 4 in. × 3 in. heads and sills, and 4 in. × 4 in. corner posts, with flat joists on top furred up out of 5 in. × 2 in. Cover top and sides with 1 in. (or $\frac{3}{4}$ in.) rough boarding, edges shot, and put a 2 in. rounded roll round the top edges, and $1\frac{1}{2}$ in. angle fillets against junction of sides with roof. The door to be an $1\frac{1}{2}$ in. wrought deal rebated casement, in two squares, glazed with $\frac{1}{8}$ in. rolled close ribbed plate glass in putty, and sprigged, and hung with 3 in. wrought butts, to a 4 in. × 2 in. rebated frame, with 7 in. × 3 in. weathered, throated and rebated deal (or oak) sill, and 1 in. beaded fascia. Fasten door with two 9 in. iron barrel bolts.





The door may have wood panels.

For lead covering, see clause No. 13 in Plumber.

If the dormer show in a room, the inner sides and soffit may be covered with $\frac{3}{4}$ in. matched and beaded boarding, grooved for plastering, and with angle beads along the edges; the door might then be moulded, and the frame beaded.

Dormer windows.

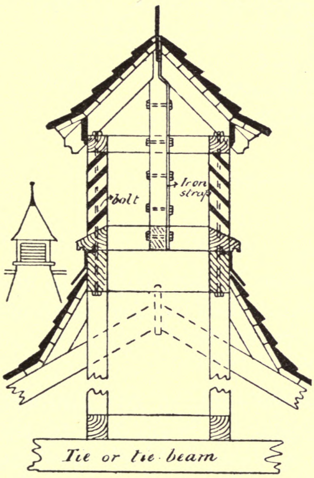
(95)—See clause No. 155. Describe the framing as clause No. 94; for any rafters, ridges, hips, valleys, ceiling joists, rolls, boarding and other items, see clauses Nos. 107 to 110, 112, 75 to 89 and 91, according to the various spans and requirements.

Bays.

(96)—Describe the roof timbers to bays (or any other projection from the main wall) as in clauses Nos. 107 to 110, 112, 75 to 89 and 91, according to the various spans and requirements.

Flèche or turret.

(97)—In addition to the rafters, hips, sprockets, collars, boarding felt, secret gutters to hips, and other items referred to in clause No. 95, a central post should be described, some 4 in. to 6 in. square, taken down to a strong fixing. The louvres may be framed up in oak, supported to a timber framing secured to the main timbers of the roof with bolts and straps. The finial, if in iron or copper, must be secured to the centre post some 4 ft. to 6 ft. down, with a wrought-iron bar strap bolted to it.



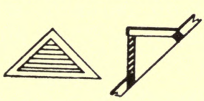
The louvres would be somewhat similar to clause No. 175. State if flaps are required for closing against the louvres, with lines, pulleys and cleats.

Bell cot.

(98)—May be similar to a flèche, see clause No. 97. The covering may be in slate, tiles, shingles, lead or copper. Give a p.c. sum for the bell, with rope, pull and gear.

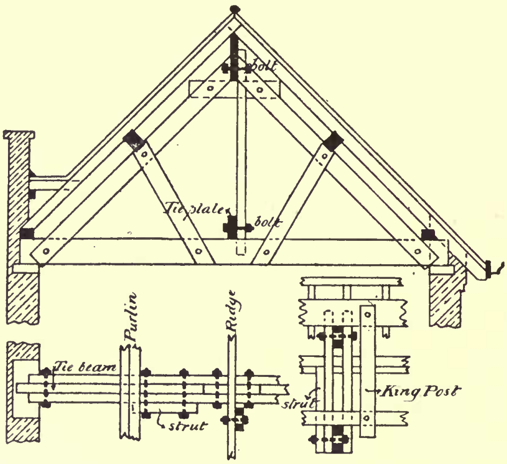
Louvre ventilators.

(99)—The framing would be similar to clause No. 95, and the louvres somewhat similar to clause No. 175.



Unframed king post truss.

(**100**)—A cheap method of constructing an unframed king post truss for small spans, say up to 30 ft., may be formed with ordinary $1\frac{1}{2}$ in. (2 in., $2\frac{1}{2}$ in. or 3 in.) planks, bolted together with $\frac{5}{8}$ in. bolts, nuts, heads and washers, in the following manner:—



Plan of Truss *Section through Truss*

The tie beam to be in one timber, bolted to the feet of principal rafters, and to the feet of struts with a filling-in block between.

The principal rafters to be each in two timbers, bolted to the ends of the tie beam and to the heads of struts, with a filling-in block between, and spiked to the ridge with a filling-in collar piece, bolted through.

The struts to be each in one timber, bolted to the principal rafters, and to the tie beam, with the filling-in blocks between.

The king post to be in one timber, bolted to the ridge, and to a horizontal tie plate fixed to the tie beams with a strap iron.

The purlins, common rafters, ridge and other roof timbers and finishings would be as in an ordinary framed roof; see clauses Nos. 75 to 99.

Give the sizes of the timbers according to the spans.
See notes as to the use of a tie plate under clause No. 75.

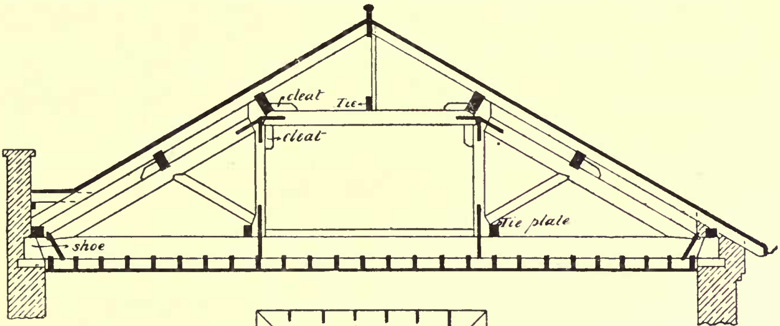
Queen Post Roof.

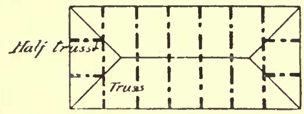
(Suitable for Spans from 30 ft. to 45 ft.)

(Clause No. 101.)

Queen post truss, 40 feet span.

(101)—Describe in a similar manner as to a king post truss, mentioned in clauses Nos. 74 to 76, the following items:—





The number of trusses and half trusses; there would be two half trusses at each end. The tie beams, principal rafters, struts, purlins, cleats, ridge, hip rafters, valley rafters, pole and wall plates, common and jack rafters, dragon pieces and angle brace ties, and straps, with the addition of,

Queen posts out of 6 in. × 4 in.

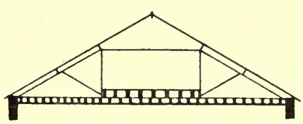
Straining beam 7 in. × 6 in., with 18 in. × 6 in. × 4 in. cleats under (and perhaps above).

Straining sill 5 in. × 4 in.

Two tie plates 6 in. × 3 in. in long lengths, scarfed at joints (see note under clause No. 75).

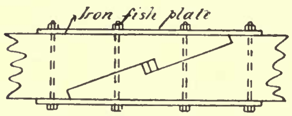
Then follow on with, as in clauses Nos. 77 to 99, the gutters, cesspools, box gutters, secret gutters, valley boards, tilting fillets, hip and ridge rolls, roof boarding, fascia, eaves soffit, barge boards, finials, snow boards, roof ladders, ceiling joists, trap door, dormer access to roof, dormer windows, bays, flèche, turret, bell cot and louvres.

A horizontal tie, say 6 in. × 3 in., may be placed along the top of the straining beams, with vertical posts, say 7 in. × 2 in., every 5 ft. apart, as a help to support the ridge.



If a room be required in the roof, and the tie beam carry the joists, then it must be made sufficiently strong to carry this extra weight; in fact it acts as a girder under these conditions.

If the tie beam cannot be obtained sufficiently long in one length for the span, state it is to be scarfed together and wedged up tight with oak wedges, and secured with $\frac{1}{4}$ in. wrought-iron fish plates, 3 ft. long by the width of the beam, and bolted on with four $\frac{1}{2}$ in. bolts, nuts and heads.

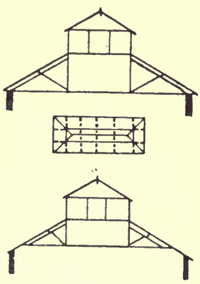


This form of scarfing will hold together without bolts or fish plates.

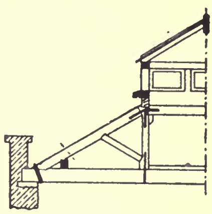
When no bolts or fish plates are used, the length of the scarf should be twelve times the depth of the timber with fir timber, and six times the depth with oak timber.

When the scarf depends on bolts without fish plates, it should be six times the depth of the timber with fir timber, and three times the depth with oak timber.

When bolts and fish plates are combined, the scarf should be four times the depth of the timber with fir timber, and twice the depth with oak timber.



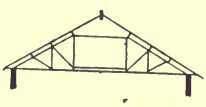
When a lantern is required to a roof, a queen post truss forms the best method of support. If the span be small, say up to 30 ft. (which is usually spanned by a king post truss), it will nevertheless be found better to use a queen post truss; the top purlins forming a support to the lantern kerb. In these small spans the struts may be omitted, and if necessary the tie beam may be kept up somewhat.



To reduce the height of the lantern kerb, the common rafters may be placed with the upper sides flush with the principal rafter of the truss, and supported by purlins bearing on the tie beams.

For lantern lights see clause No. 129.

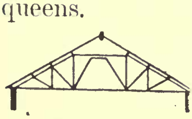
Queen and Princess truss.



(102)—Suitable for roofs from 45 ft. to 60 ft. span. But this class of roof truss in timber is seldom used now, iron and steel having taken its place. Describe in a similar manner all the timbers as in a queen post truss; see clause No. 101, with the addition of,

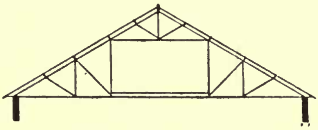
Princess posts out of 7 in. × 3 in.

The straining sill goes between the princess posts as well as the queens.



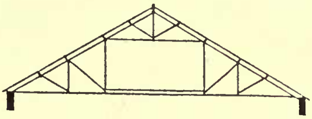
If two struts be inserted between the queen posts, the straining sill piece would not be required. See remarks as to scarfing tie beams, under clause No. 101.

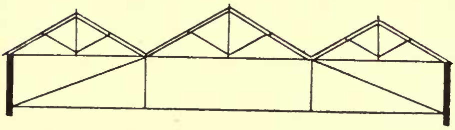
Roofs of greater spans may be formed as sketch. Practically it has a king post truss at top, with a queen and princess truss beneath. See remarks as to scarfing tie beams under clause No. 101. But this class of roof truss in timber is seldom used now, iron and steel having taken its place.



Composite roofs.

(103)—Suitable for spans from 65 ft. to 90 ft. See remarks as to scarfing under clause No. 101. But this class of roof truss in timber is seldom, if ever, now used, iron and steel having taken its place.

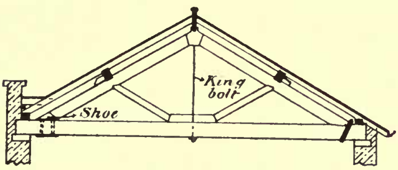




Suitable for spans from 70 ft. to 85 ft. This class of roof is practically a queen post truss, with three king post trusses above. See remarks as to scarfing tie beams under clause No. 101. But the lower part of this roof truss in timber is seldom, if ever, now used, iron and steel having taken its place.

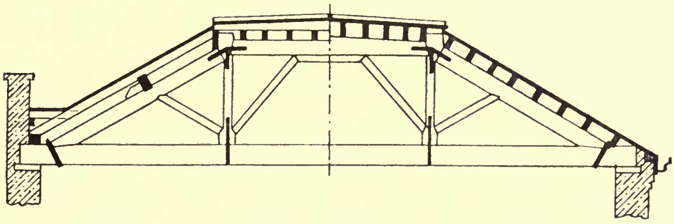
Iron and timber roofs.

(104)—These roofs are formed both with timber and iron. The ironwork may consist of wrought-iron king bolts, cast-iron shoes for feet of rafters and struts, and cast-iron sockets to receive the heads of rafters and king bolts. There are many ways of constructing roofs with timber and iron.



Roof with flat top.

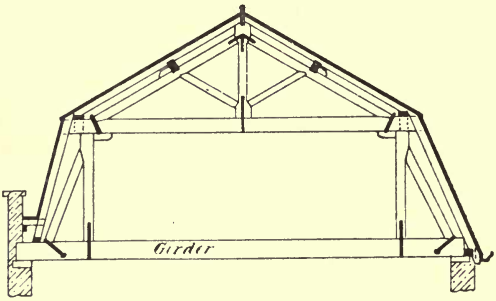
(105)—When a flat top is required to a roof it may be formed as sketch; the sizes of timbers being the same as for a queen post truss, see clause No. 101,



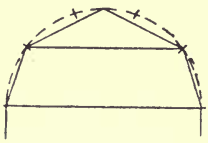
with the addition of the flat joists on top. The purlins might be omitted, and the common rafters laid across from truss to truss. For the flat timbers, see clauses Nos. 113 to 123.

Mansard or curb roof.

(106)—The sketch will show how this form of roof may be described; the upper part being a king post truss, supported on posts having a fixing on a girder. See clauses Nos. 74 to 99 for items under a king post truss.

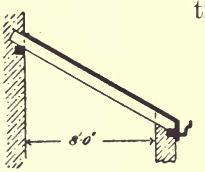


The use of this form of roof is for obtaining attics in the roof. It is best to get the contour of roof within a semicircle, divided into five parts. The girder must be strong enough to take the weight of the roof and the floor, and the posts and struts strong enough to take the weight and thrust of the roof. The outermost timbers would be ordinary rafters.



Lean-to roof.

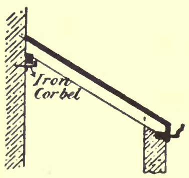
(107)—This form of roof may be used for spans up to 8 ft., such as to small outbuildings and w.c.'s. The timbers generally to be described are:—

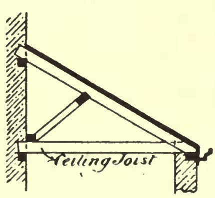


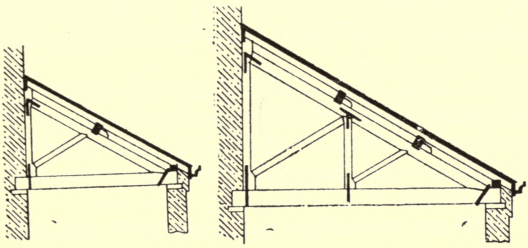
The rafters, 4 in. × $2\frac{1}{2}$ in.
Wall plates, 4 in. × 3 in.
Tilting fillets, see clause No. 82; and sprockets, see clause No. 75, if required.
Fascia, see clause No. 85.
Roof boarding, see clause No. 84.
Eaves soffit, see clause No. 86, if required.
And 7 in. × 1 in. beaded verge boards.

If this roof be cut up with hips, valleys, gutters, or in other ways, then see clauses Nos. 75, 77 to 81, 83, 89, 92 to 96 and 99, for such items as may be required.

The upper wall plate may be fixed to the face of the wall on cast-iron corbels; see Smith, clause No. 26, for corbels. Ceiling joists may be required; see clause No. 91. A purlin and strut may be necessary to support the rafters if the span be much greater; see clause No. 75 for purlins and struts.

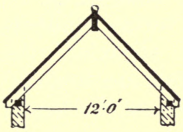






Lean-to roofs may be of some considerable span if framed up in a similar way to a king or queen post roof truss, as in clauses Nos. 75 and 101 respectively.

Rafter and ridge roof.



(**108**)—This form of roof may be used up to 12 ft. span with :—

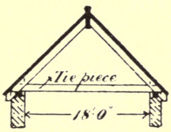
Rafters 4 in. × 2½ in.

Ridge 7 in. × 1½ in.

Wall plates 4 in. × 3 in.

Also see clauses Nos. 75, 77 to 89, and 91 to 99, for any other parts to the roof which may be required, such as tilting fillets, sprockets, boarding, fascia, eaves soffits and other items.

Plain rafter and ridge roof with tie pieces.



(**109**)—Suitable for spans up to 18 ft., with :—

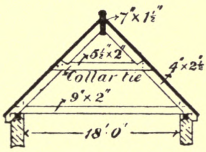
Rafters 5½ in. × 2½ in.

Ridge 8 in. × 1½ in.

Wall plates 4 in. × 3 in.

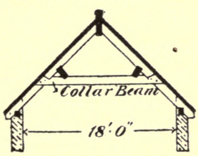
Tie pieces 9 in. × 2 in.

See clauses Nos. 75, 77 to 89, and 91 to 99, for any other parts to the roof which may be required, such as tilting fillets, sprockets, boarding, fascia, eaves soffits, and other items.



A collar tie will strengthen this form of roof, and perhaps it is necessary for spans over 14 ft., when of course the scantlings of the various timbers would be reduced.

Collar beam roof.

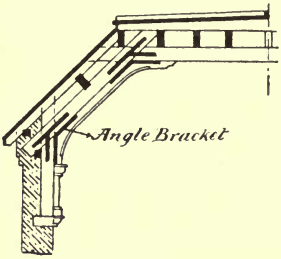


(**110**)—Suitable for spans up to 18 ft., with :—

Rafters 4 in. × 2½ in.
Ridge 7 in. × 1½ in.
Collars 5½ in. × 2 in.
Wall plates 4 in. × 3 in.
Purlins 5 in. × 3 in.

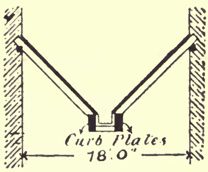
See clauses Nos. 75, 77 to 89, and 91 to 99, for any parts to the roof which may be required, such as tilting fillets, sprockets, boarding, fascia, eaves soffits and other items. This form of roof is used in small attics and other places, to give additional room below, without increasing the height of the walls.

The following sketch shows a class of roof which may be employed for spans up to 25 ft., when such a shape is required to show in the room below, and at the same time dispensing with cross ties and ridge piece.



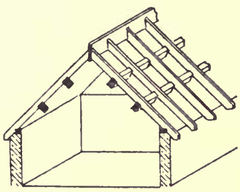
It may be constructed with the principals halved and bolted together at the junctions of the timbers, with the addition of wrought-iron angle brackets screwed on to the under side of the timbers, as well as with straps on each face bolted through. The vertical timbers should be of some length. Circular ribs, either plain or moulded, may be added. If the principals are to show, then they should be wrought and moulded or chamfered on the under side.

Valley roof.



(111)—Suitable for span up to 18 ft.; see clauses Nos. 75, 77 to 89, and 91 to 99, for the various parts to the roof which may be required, and in addition describe the kerb (gutter) plates of such scantling according to the length. The rafters may be $4\frac{1}{2}$ in. $\times 2\frac{1}{2}$ in., and the wall plates 4 in. $\times$ 3 in.

Purlin roof.

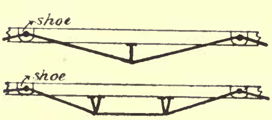


(112)—In a range of buildings intersected frequently with cross walls going up to the slating, the roof may be constructed without any cross timbers, the rafters being supported by the purlins. The timbers required would consist of:—

The rafters.
Ridge.
Wall plates.
Purlins.

See clauses Nos. 75, 77 to 89, and 91 to 99 for any other parts to the roof which may be required, such as tilting fillets, sprockets, boarding, fascia, eaves soffits and other items.

If the cross walls be some distance apart, say over 10 ft., then the purlins should be trussed to prevent their sagging, with wrought-iron rods and cast-iron hangers and shoes. The depth of the trussing should be one-eighth of the length.



Domes and Cupolas.

(Clause No. 112a.)

Large domes are usually now constructed in iron and steel.

The base of a dome or cupola may be a circle, an ellipse or a polygon. The ribs may be solid, or in thicknesses built up together; the latter being the stronger, and either with or without cross ties. In domes without horizontal ties, each rib may be formed of two or more thicknesses of timber of the following sizes, the ribs being placed about 2 ft. apart at the base.

Philibert de l'Orme gives that:—

For spans 24 ft. clear, the ribs may be formed of two 8 in. × 1 in. timbers.

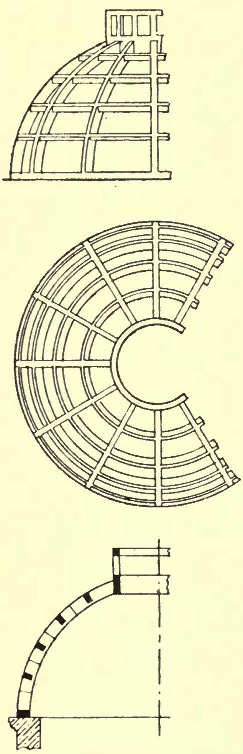
For spans 36 ft. clear, the ribs may be formed of two 10 in. × $1\frac{1}{2}$ in. timbers.

For spans 60 ft. clear, the ribs may be formed of two 13 in. × 2 in. timbers.

For spans 90 ft. clear, the ribs may be formed of two 13 in. × $2\frac{1}{2}$ in. timbers.

For spans 108 ft. clear, the ribs may be formed of two 13 in. × 3 in. timbers.

Timber framed dome.



(112a)—For a dome 24 ft. internal diameter, with a circular base and without cross ties, the description may run:—

The dome to be formed with ribs spaced 2 ft. apart at the base, each rib being composed of two (or three) 8 in. × 1 in. planks, in three (or four) feet lengths breaking joint, and cut to the shape of the dome, and bolted together every 1 ft. apart with $\frac{3}{4}$ in. bolts, nuts, heads and washers, and secured at the base to a 9 in. × 6 in. sole piece (kerb), halved and bolted at joints with $\frac{3}{4}$ in. (or $\frac{1}{2}$ in.) bolts, nuts, heads and washers (or secured to a sole piece composed of two 9 in. × 3 in. timbers breaking joint, bolted together with $\frac{1}{2}$ in. bolts, nuts, heads and washers). The rafters between the ribs to be cut out of 6 in. × $2\frac{1}{2}$ in. and spiked on. The head piece to be 12 in. × 5 in., formed up in three depths, breaking joint, and bolted together with $\frac{1}{2}$ in. bolts, nuts, heads and washers. Then describe the boarding and the rolls for lead, the lantern; and the finishing to the under side of the dome, which may be in plaster, or in boarding, either plain or panelled.

An iron band or chain may be put round the sole piece as a tie. Every alternate rib may stop short of the apex of the dome, should they be too confined at that point.

In a dome with cross ties, the ribs may be of less size, and framed somewhat on the principle of a roof truss or the centre to an arch. In this case the interior of the dome should not show from below.

Ornamental shaped roofs.

(**112b**)—The construction of these forms of roofs would be similar to ordinary roofs; the shaped portion being formed with filling-out pieces, secured to the rafters. If the roof be hollow shaped in one curve on the outer side, the rafters if deep enough might be cut to the curve. These roofs are generally found in small shelters and summer houses.

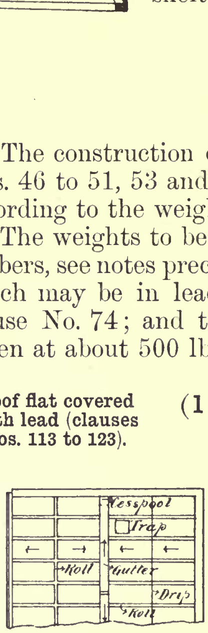
Roof Flats.

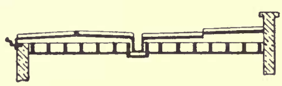
(Clauses Nos. 113 to 128.)

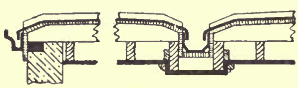
The construction of roof flats is similar to that of floors, see clauses Nos. 46 to 51, 53 and 55 to 57; but the scantlings would be modified according to the weights on flats.

The weights to be considered in constructing a roof flat, are the flat timbers, see notes preceding clause No. 46; the boarding, and the covering which may be in lead, zinc, or copper; and snow, see notes preceding clause No. 74; and the pressure of the wind, which on a flat may be taken at about 500 lbs. per square (100 super. ft.).

Roof flat covered with lead (clauses Nos. 113 to 123).

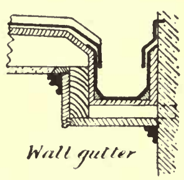






Eaves *Box gutter*

(**113**)—Form flat over the back addition with:—
Joists 7 in. × $2\frac{1}{2}$ in. (size varies as to span), furred up with $2\frac{1}{2}$ in. stuff to falls of 2 in. in 8 ft. (or 10 ft.), with the ends of furrings (or joists) at walls and gutter eaves splayed off for some 4 in. (or 6 in.) back from 1 in. deep. Put 2 in. (or $1\frac{1}{2}$ in.) cross rebated drips every 8 ft. (or 10 ft.) apart.
Wall plates 4 in. (or $4\frac{1}{2}$ in.) × 3 in. in long lengths, scarfed at joints, and halved and dovetailed at angles.
Gutter plates (kerbs) 9 in. × 3 in. (varies as to span and load).
$1\frac{1}{4}$ in. (or 1 in.) × 9 in. (12 in., 15 in. or 18 in.) gutter boards and framed bearers, with 2 in. (or $1\frac{1}{2}$ in.) cross rebated drips every 10 ft. apart, and $1\frac{1}{2}$ in. angle fillets along the angles.



If a box gutter project into a room, it may be lined round on the under side, with 1 in. wrought, grooved and beaded linings, with perhaps a small moulding against the wall and ceiling as a finish. An 1 in. (or $\frac{3}{4}$ in.) splayed flashing board may be taken in the gutter against the wall to dress the lead over. Herring-bone strutting is not often put to flat joists, the boarding above forming a tie. Pugging and felt will add to the warmth and coolness of the room below.

Cesspools. (**114**)—See clause No. 78.

Boarding. (**115**)—Cover flat with 1 in. (or $\frac{3}{4}$ in.) rough boarding, edges shot, laid with horizontal joints (or diagonally).

The boarding may be iron tongued, see clause No. 61.

Felt. (**116**)—Lay over the flat and gutter boarding under the rolls best asphalted roofing felt about $\frac{1}{8}$ in. thick, properly passed, lapped and tacked on every 3 in. apart with $1\frac{1}{8}$ in. clout nails 5 lb. per 1000 (or 1 in. copper nails).

Felt may also be put under zinc and copper covered flats. See notes to clause No. 8 under Slater, for other kinds of felt.

Tilting fillets. (**117**)—Put $1\frac{1}{2}$ in. (or 2 in.) angle tilting fillets against junctions of flat with walls, skylights and trap doors.

Trap door. (**118**)—See clauses Nos. 92 and 93.

Rolls. (**119**)—To be 2 in. × 2 in. rounded deal, spaced 2 ft. 6 in. centres.

Also see clause No. 4 under Plumber, for rolls; and clauses Nos. 1 and 4 under Zincworker, and clause No. 1 under Coppersmith.

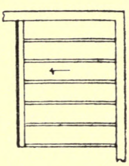
Fascia. (**120**)—1 in. (or $1\frac{1}{4}$ in.) × 7 in. (or 9 in.) wrought deal beaded fascia screwed to ends of joists.

Pugging. (**121**)—See clause No. 46 if required.

Strutting. (**122**)—See clause No. 49 if required.

Ceiling joists. (**123**)—See clauses Nos. 53, 55 and 56 if required.

Small lean-to flat. (**123a**)—In a small flat like that over an outside w.c., the timbers required would be:—

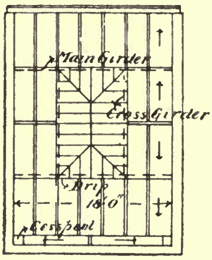


Joists cut to give fall, see clause No. 113.
Wall plates, see clause No. 113.
Tilting fillets against walls, see clause No. 117.
Fascia round two sides, see clause No. 120.
Boarding, see clause No. 115.
Felt and pugging, see clauses Nos. 116 and 121 respectively.
Rolls, see clause No. 119.

For any other items which might be required, see clauses Nos. 113, 114, 118 and 122.

Flat with lantern light (clauses Nos. 124 to 128).

(124)—Each of the two main girders carrying the lantern light to be formed of two 11 in. × 4 in. fir timbers, with an 11 in. × $\frac{1}{2}$ in. wrought-iron flitch plate between, bolted through every 2 ft. apart at alternate heights with $\frac{1}{2}$ in. (or $\frac{3}{4}$ in.) bolts, nuts, heads, and 4 in. × 4 in. × $\frac{1}{4}$ in. wrought-iron washers placed on the face of the timbers. The girders to rest 9 in. on walls at each end, with 2 ft. 6 in. × 9 in. × 3 in. tooled York templates under.



Each of the two cross girders between the two main girders to be one 11 in. × 4 in. fir timber, secured to the main girders with 11 in. × 5 in. × $\frac{3}{8}$ in. wrought-iron angle plates on each side, and bolted through with four $\frac{1}{2}$ in. (or $\frac{3}{4}$ in.) bolts, nuts, heads, and 4 in. × 4 in. × $\frac{1}{4}$ in. wrought-iron washers to each angle plate.

An 1 in. diameter bolt with nuts, heads and washers may in addition run along the side of each of the two cross girders, to tie the main girders together.

Then describe the joists, the furring, the drips, wall plates, gutter plates, gutters and drips, cesspools, boarding, felt, tilting fillets, trap door, rolls, fascia, pugging, strutting, and ceiling joists, as in clauses Nos. 113 to 123.

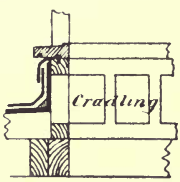
The girders vary in scantling according to the loads and spans.

The main girders may be of rolled iron or steel joists instead of flitch plates, to which the cross girders would be bolted in the same way.

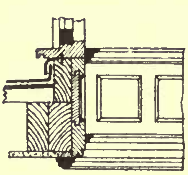
Lantern kerb.

(125)—To be 3 in. thick, standing up 4 in. above level of flat at highest point, grooved all round for water bar, and dovetailed at angles.

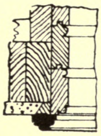
If for some cause the lantern kerb be very deep, it would be a waste of material to form it up off the girders in solid timber. It may then take the form of simple cradling, with 3 in. × 3 in. heads, sills and angle posts, dovetailed together with 3 in. × 2 in. studs every 2 ft. apart.



Linings.

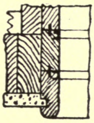


(126)—Line round the kerb framing with $1\frac{1}{4}$ in. (or $1\frac{1}{2}$ in.) deal moulded panelled framed apron linings, tongued at angles, beaded (or moulded) on edge, with a 3 in. × 2 in. capping (sill) moulding and 2 in. × $1\frac{1}{2}$ in. necking moulding planted round, and a $2\frac{1}{2}$ in. × $1\frac{1}{2}$ in. soffit moulding on narrow splayed grounds.



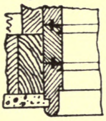
The linings may also be 1 in. wrought deal grooved and tongued, matched and beaded boarding, with staff bead on edge, and $2\frac{1}{2}$ in. $\times$ $1\frac{1}{2}$ in. soffit moulding on narrow splayed grounds.

or



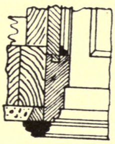
1 in. wrought deal beaded, grooved and cross-tongued boarding, with rounded edge and grooved for plaster.

or



1 in. wrought deal beaded, sunk, grooved and cross-tongued boarding, with rounded edge and grooved for plaster.

or

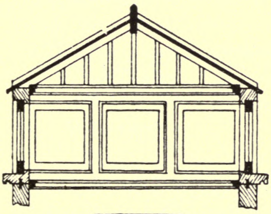


$1\frac{1}{4}$ in. (or $1\frac{1}{2}$ in.) wrought deal sunk and moulded panelled framing, tongued at angles, beaded (or moulded) on edge, and with a $2\frac{1}{2}$ in. $\times$ $1\frac{1}{2}$ in. soffit moulding on narrow splayed grounds.

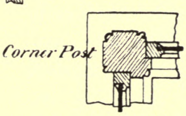
The capping (sill) moulding would be required in each case.

Lantern.

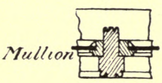
(**127**)—The lantern to be framed with :—



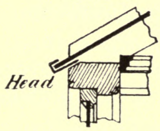
$4\frac{1}{2}$ in. $\times$ $4\frac{1}{2}$ in. wrought, twice rebated, twice beaded (or twice chamfered or neither) and twice (or once) staff beaded angle posts.



$4\frac{1}{2}$ in. $\times$ 3 in. twice rebated, twice beaded (or twice chamfered or neither) and twice staff beaded intermediate posts.

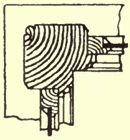


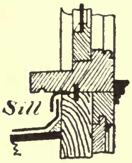
$4\frac{1}{2}$ in. $\times$ 4 in. splayed, rebated, beaded (or chamfered or neither) and staff beaded head, with a 3 in. $\times$ $1\frac{1}{2}$ in. moulding round planted on.



If the skylight glass be kept some $\frac{1}{4}$ in. ($\frac{1}{2}$ in. to $\frac{3}{4}$ in.) clear of the head, a condensation gutter will not be required.

If the angle posts are out of 6 in. × 6 in., the look of the lantern on the inside will be much improved, and in this case it would be three times rebated and staff beaded instead of twice.





7 in. × 3 in. (or $3\frac{1}{2}$ in.) twice sunk, twice weathered, throated, grooved and staff beaded oak sill, secured with handrail screws at angles, with an $1\frac{1}{8}$ in. × $\frac{1}{4}$ in. galvanised iron water bar bedded in white lead, and $2\frac{1}{2}$ in. × 2 in. sill moulding round planted on.

Fill in the lantern framing with 2 in. ($1\frac{3}{4}$ in. or $1\frac{1}{2}$ in.) moulded sashes, rebated all round for glass. Each sash to be hung at top (or sides) on one pair of 3 in. brass (or wrought-iron) butts, and glazed with 21 oz. fluted sheet glass in putty, and sprigged.

The vertical lights to skylights are frequently glazed with leaded glass, similar to clauses Nos. 10 and 11 in Glazier.

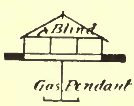
State if sashes are hung on centres, see notes to clause No. 170; or if sashes are in small squares, also see notes to clause No. 170.

Gear. Allow the p.c. sum of £5 for opening and shutting gear to sashes.

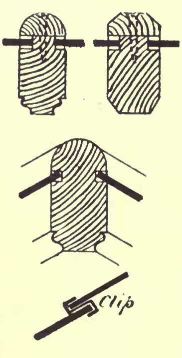
It is usual to open and shut the vertical lights of lanterns with some special gearing, so that all the lights on each side can be opened at one time.

If the sashes are provided with lines, cleats, pulleys and fastenings, see notes to clause No. 170.

For blind, see Carpenter, clause No. 163, with notes, and for gasfitting, see Gasfitter, notes to clause No. 8. Electric lights would be fixed in the same position as gas.



Skylight.



The skylight framing to be formed with 3 in. × 2 in. twice rebated and twice moulded (or twice chamfered) bars with 2 in. × 2 in. rounded (or twice splayed) capping on top, screwed with brass (or iron) rose-headed screws; 4 in. × 2 in. similar hips, and 7 in. × $2\frac{1}{2}$ in. twice grooved, rounded (or twice splayed) and twice moulded ridge. Glaze skylight with $\frac{1}{8}$ in. ($\frac{3}{16}$ in. or $\frac{1}{4}$ in.) rolled, close ribbed plate in putty, the sheets to lap at joints $\frac{1}{2}$ in. (to 1 in.), and be cut a segmental shape, and clipped together with copper (or zinc) clips $\frac{1}{2}$ in. (or $\frac{5}{8}$ in.) wide screwed to head. The glass eaves to overhang the lantern head 2 in., and be kept $\frac{1}{2}$ in. up clear of the lantern head.

The hips may be formed similar to the ridge.

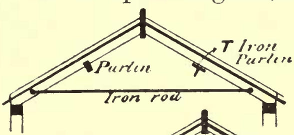
For iron skylights see Smith, clause No. 28.

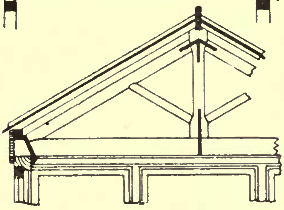
See clause No. 4 under Glazier for another method of glazing skylights.

If a skylight be glazed with clear sheet, it is always well to glaze the eaves portion with rolled plate glass for about 12 in. to 18 in. up, as the eaves are always liable to crack through icicles clinging to them during frosty weather.

In this method of skylight framing to a lantern, the bars act as rafters.

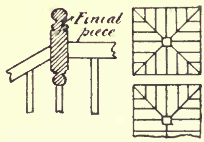
If the span be great, then either the bars must be stronger or else purlins will be required, which may be in small T iron or timber connected to strong hip rafters, and perhaps iron rod ties also may be necessary.





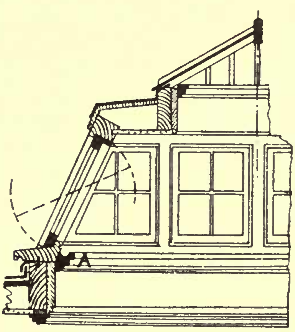
The skylight framing, if of considerable span, may be supported on a king post construction.

If three or more of the bars meet at the junction of the hips with the ridge, a 3 in. × 3 in. wrought, turned, finial stop will be required, otherwise there is nothing for the bars to frame into.

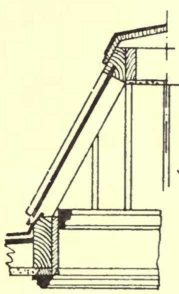


Here are a few further details of lantern lights:—

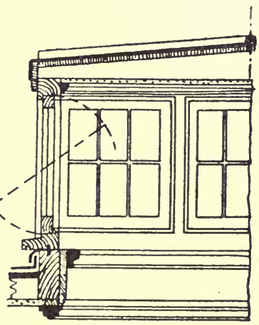
A condensation gutter is required at A, which may be formed in the moulding and lined with 4 lb. lead, with outlet holes bored through the sill, and short lengths of ½ in. lead pipe taken through to the outside.



Lantern with Skylight.



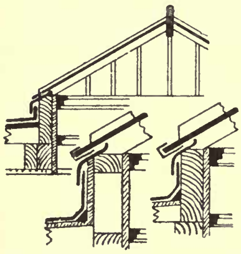
Lantern with plain bars.



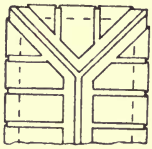
Lantern with flat on top.

The side lights of lanterns may be to similar details as casement lights, see clause No. 170, with notes.

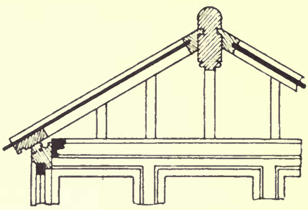
If there be only a skylight and no vertical side lights, then the description of the skylight would be similar to the "skylight" paragraph of this clause; and the kerb would be described as 3 in. thick, in splayed rough deal; the apron linings would be similar to those in clause No. 126. The kerb, if deep, would be framed up in cradling as in notes to clause No. 125.

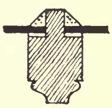


Skylights may also be formed with framing instead of merely with bars, when the description would run:—



The skylight to be formed with 2 in. ($1\frac{3}{4}$ in. or $1\frac{1}{2}$ in.) framing, having:—





$4\frac{1}{2}$ in. (to 6 in.) moulded (or chamfered) ridge and hip wings grooved for glass, and rebated into the ridge and hips.

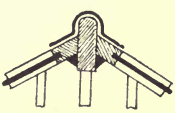
6 in. throated bottom rail, kept $\frac{1}{4}$ in. clear of the glass.

$1\frac{1}{2}$ in. (or 2 in.) twice rebated and twice moulded (or twice chamfered) bars.

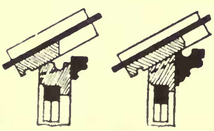
6 in. $\times$ $2\frac{1}{2}$ in. twice grooved, rounded and twice moulded ridge and hips.

Glaze skylight with $\frac{1}{8}$ in. ($\frac{3}{16}$ in. or $\frac{1}{4}$ in.) rolled close-ribbed plate in putty, the sheets to lap at joints $\frac{1}{2}$ in. (to 1 in.), and be cut a segmental shape, and clipped together with copper (or zinc) clips $\frac{1}{2}$ in. (or $\frac{5}{8}$ in.) wide screwed to head. The eaves to overhang the bottom rail 2 in.

Instead of grooving the hip and ridge and rebating the framing into them, a small wrought angle fillet may be spiked on to catch the framing; and the hips and ridge dressed over with 5 lb. lead screwed on with copper screws and lead dots to cover the heads. The bars and framing may be square on the under side.



The glazing may bed down on to the bottom rail, which may also be splayed on the inner edge. With this form of skylight framing a condensation gutter is necessary; it may either be formed in the lantern head (or kerb), or out of the moulding planted round the head (or kerb), with $\frac{1}{2}$ in. outlet holes every 2 ft. apart bored through the head (or kerb) to the outside. The gutter and outlet holes may be lined with lead.



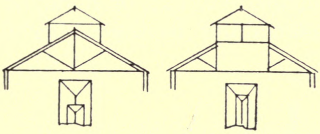
Skylight guards and ventilator.

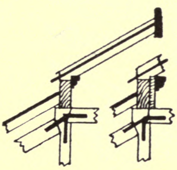
(128)—See Smith, clauses Nos. 31 and 28 respectively.

If a lantern have a flat on top, it will the more readily take a ventilator.

Lanterns over king or queen post roofs.

(129)—Lantern lights to king and queen post roofs are framed up in a similar manner to clause No. 127, or as mentioned in the notes under that clause.





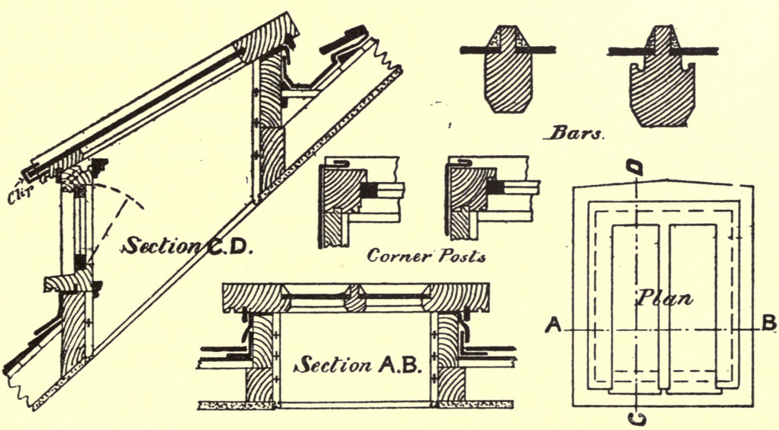
If only a skylight be required, then also see notes under clause No. 127; the kerb piece might be wrought, or else finished with linings as in clause No. 126. Also see notes referring to lanterns under clause No. 101.

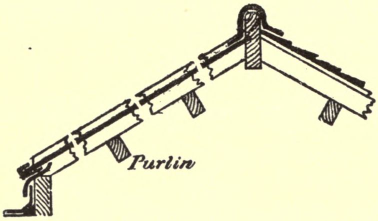
Skylights in roof planes.

(130)—Also see clause No. 93.

It is somewhat difficult to keep the weather out of a roof light when the skylight portion is hinged for ventilation. It is a better plan to put a small vertical light to open, with a fixed skylight over.

Here are a few details of this form of skylight; they are especially useful over larders and w.c.'s when ordinary windows cannot be obtained. When over larders, perforated zinc may be described over the sash portion, see clause No. 153.

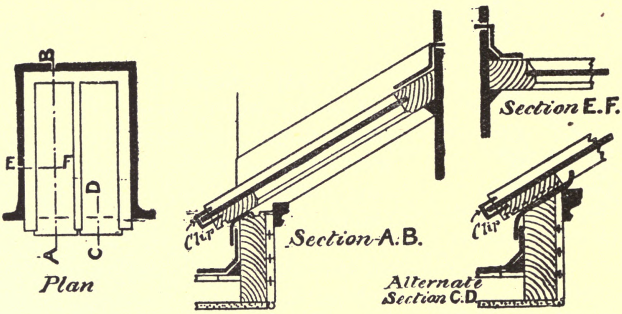




Large fixed skylights in roof planes may be formed with rafter bars, as in clause No. 127 and notes.

Skylights against walls.

(**131**)—Here are a few details:—The framing would be similar to the notes in clause No. 127, or it might be formed with bars somewhat similar to the skylight paragraph in clause No. 127.

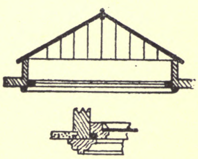


Iron skylight.

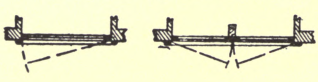
(**132**)—See Smith, clause No. 28.

Ceiling lights to skylights.

(**133**)—Form ceiling light with a 2 in. (or $1\frac{1}{2}$ in.) moulded deal sash in small squares, rebated out for glass, and glazed with 16 oz. muffled sheet (or other obscured or clear glass) in putty. Rebate out the sash on the outer edges, and fix to fillets spiked to kerb of skylight.

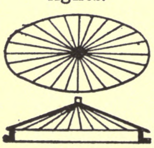


Provision should be made for cleaning the ceiling light, either by hinging it to the kerb and fastening it with bolts, or else by access from the outside.

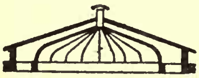


Elliptical skylights.

(**134**)—These would be constructed with straight bars similar to an ordinary skylight. See the skylight paragraph in clause No. 127. The kerb would have to be built up similar to the kerb of a dome, see clause No. 112a.



Skylights over staircases.



(134a)—Lantern lights and skylights are especially useful over staircases, and, according to the requirements of the case, may be similar to some of clauses Nos. 125 to 134. In principal staircases a double skylight may be employed, the outer framing being in wood or iron, similar to the clauses just mentioned; and the inner light being either as in clause No. 134, or else, if in iron, then similar to clause No. 28 in Smith, and clause No. 15 under Glazier.

Quartered Partitions.

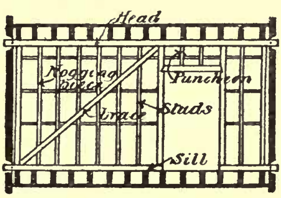
(Clauses Nos. 135 to 137.)

It is better to let quartered partitions have a direct bearing on the walls, and not to rest upon the floor joists; but in ordinary work of small spans it is usual to let the partitions rest upon the floors, and in this case braces are not absolutely necessary. Floor joists should not have a bearing upon partitions unless they be specially framed to receive them. Where a quartered partition joins brickwork the plastering usually cracks, owing to the shrinkage of the timber and the settlement of the walls.

If the studs be over 2 in. wide, the edges should be taken off to give a better key for the plastering. Nails from which to hang pictures can only be securely driven into quartered partitions where the studs and nogging pieces occur.

Quartered partition of small height resting on a floor.

(135)—The framed quartered partitions on the first and second floors to be mortised and tenoned together, having:—



$4\frac{1}{2}$ in. (or 4 in.) × 4 in. (or 3 in.) heads and sills bearing $4\frac{1}{2}$ in. on walls, with $4\frac{1}{2}$ in. (or 4 in.) × 4 in. (or 3 in.) wall posts, door posts and door heads; the wall posts to have the arrises taken off $\frac{1}{2}$ in. (or $\frac{3}{4}$ in.) as a better key for the plastering.

$4\frac{1}{2}$ in. (or 4 in.) × 3 in. braces.

$4\frac{1}{2}$ in. (or 4 in.) × 2 in. studs (quarters) and puncheons, placed at 12 in. centres.

$4\frac{1}{2}$ in. (or 4 in.) × $1\frac{1}{2}$ in. nogging pieces every 3 ft. (or 4 ft.) apart, the first row being placed 12 in. down from the ceiling 2 in. thick, so as to form a solid rail into which nails may be driven for hanging pictures.

If partitions run parallel with and between the floor joists, then bridging pieces must be mentioned as:—

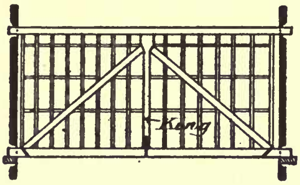
4 in. × 3 in. bridging pieces every 2 ft. apart, fixed between the joists on 3 in. × 2 in. fillets.

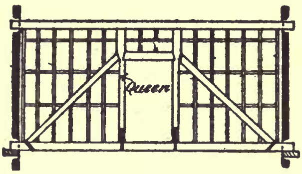
Partitions supporting their own weight only, may be constructed with:—

4 in. × 3 in. heads, posts, sills and braces for a bearing up to 25 ft.
4 in. (or 5 in.) × $3\frac{1}{2}$ in. heads, posts, sills and braces for a bearing up to 30 ft.
6 in. × 4 in. heads, posts, sills and braces for a bearing up to 40 ft.

The studs (quarters) and nogging pieces would remain the same widths in any case, namely 2 in. and $1\frac{1}{2}$ in. respectively.

In large partitions it is better to frame (truss) them either as a king or queen post construction similar to a roof, especially when they take the bearing of the floor above; thus the sill takes the place of the tie beam, the braces that of the principal rafters, and the centre posts or door posts that of the king or queen posts.





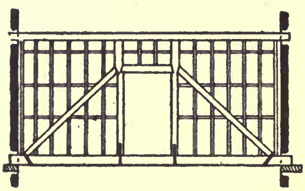
The weights to be considered would be the floor above, if it bear on the partition; together with the weight of the partition itself.

Dwelling house floors may be taken as weighing about 140 lbs. to 200 lbs. per ft. super., and see notes preceding clause No. 46 for weights on floors.

Quartered partitions may be taken as weighing about 15 lbs. to 20 lbs. per ft. super.

Trussed quartered partitions.

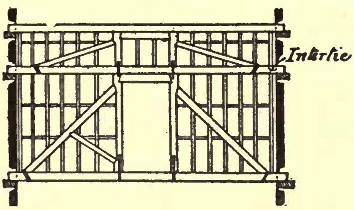
(136)—The framed quartered partitions on the first and second floors to be mortised and tenoned together, having:—

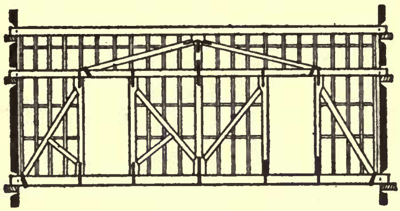


9 in. × $4\frac{1}{2}$ in. sills, with ends cased in cast-iron shoes $\frac{3}{8}$ in. metal 9 in. long, and bearing 9 in. on walls at both ends, upon 3 ft. × 9 in. × 3 in. tooled York templates.
6 in. × $4\frac{1}{2}$ in. braces.
$4\frac{1}{2}$ in. × $4\frac{1}{2}$ in. heads, bearing $4\frac{1}{2}$ in. on walls at each end.
5 in. × $4\frac{1}{2}$ in. queens and $4\frac{1}{2}$ in. × $4\frac{1}{2}$ in. wall posts (or king and wall posts), with arrises taken off $\frac{3}{4}$ in. (or 1 in.).
4 in. × $4\frac{1}{2}$ in. door heads.
$4\frac{1}{2}$ in. × 2 in. studs (quarters) and puncheons placed at 12 in. centres.
$4\frac{1}{2}$ in. × $1\frac{1}{2}$ in. nogging pieces every 3 ft. (or 4 ft.) apart, the first row being placed 12 in. down from the ceiling 2 in. thick, so as to form a solid rail into which nails may be driven for hanging pictures.

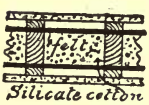
Allow $\frac{1}{2}$ cwt. per square of partitioning of wrought forged strap iron, bolts, nuts, heads, washers, plates and hanging straps, or these may be described in detail.

See Smith, clause No. 19, with notes, for sizes of straps to partitions. When a partition is somewhat high, an intertie must be mentioned. Here are two sketches of these partitions:—





Sound-resisting quartered partitions.

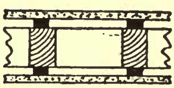


(137)—Describe the framing as clauses Nos. 135 or 136, and go on:—

Cover the partitions on both sides with hair felt, "No. 5," $\frac{3}{4}$ in. thick, 48 oz. per sheet, fill in between the studs and felting with silicate cotton (loose hair, felt or sawdust), and batten out the studs on both sides with $\frac{3}{4}$ in. (or 1 in.) × 2 in. (or $2\frac{1}{2}$ in.) fir battens to receive the plastering.

Hair felt is made in five thicknesses, in lengths up to 60 ft. by 3 ft. wide, and in sheets 20 in. wide by 34 in. long.

No. 1	size is	$\frac{1}{4}$ in.	thick,	weighing	16 oz.	per sheet.
„ 2	„	$\frac{3}{8}$ in.	„	„	24 oz.	„
„ 3	„	$\frac{1}{2}$ in.	„	„	32 oz.	„
„ 4	„	$\frac{5}{8}$ in.	„	„	40 oz.	„
„ 5	„	$\frac{3}{4}$ in.	„	„	48 oz.	„



When the stud framing is over 2 in. wide, battens may be nailed on to receive the plaster, instead of chamfering the angles as mentioned in notes preceding clause No. 135.

Brick-nogged partitions.

(138)—See Bricklayer, clause No. 65. If the walls are to be battened for wood panelling, see clause No. 189; but if battened for plastering, then see clause No. 48 in Plasterer.

Windows, Shutters and Blinds.

(Clauses Nos. 139 to 178.)

Paint frames.

(139)—Before fixing any windows in position, paint three times in oil colour those parts, both of solid and cased frames, where buried in the walls.

Bed sills. (**140**)—See clause No. 9, which may perhaps be inserted here; as also parts of clause No. 10.

Weigh sashes. (**141**)—The sashes for cased window frames to be carefully weighed after glazing, and the weights supplied to evenly balance them when hung.

Lead weights require less space than iron, lead being the heavier metal.

Window sills. (**142**)—Sills to solid and cased frames to be in English oak.

Window backs. (**143**)—Window backs to be canvassed over at back and painted three oils, the brickwork being also roughly rendered.

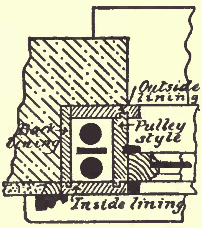
See Plasterer, clause No. 54.

Window sills should not be fixed at too great a height from the floor, otherwise it is impossible to see out of the windows when sitting near; 2 ft. 6 in. from the floor to the top of sill should be the maximum, but the lower the better.

CASED FRAMES WITH SASHES.

(Clauses Nos. 144 to 160 and 177.)

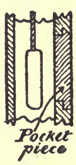
Simple cased frames in a 9 in. wall. (**144**)—Fill in each window opening to basement and servants' offices with wrought deal cased frames having:—



1 in. grooved outside linings.

1 in. twice grooved inside linings, with 1 in. (or $1\frac{1}{4}$ in.) × $\frac{3}{4}$ in. inside bead planted on.

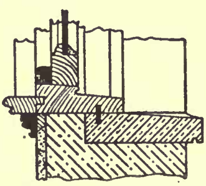
$1\frac{1}{4}$ in. twice rebated and grooved pulley styles, with pocket pieces for access to weights, and $\frac{3}{8}$ in. (or $\frac{1}{2}$ in.) parting beads.



2 in. twice rebated head linings, blocked out, and with bead planted on.

$\frac{3}{4}$ in. rebated back linings.

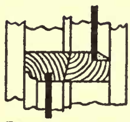
$\frac{1}{2}$ in. parting slips (or 16 gauge zinc).



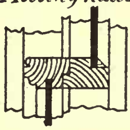
3 in. twice sunk, twice weathered and check throated oak sill, grooved for iron tongue and window nosing (or window board), with bead $1\frac{1}{2}$ in. deep planted on for ventilation, and $1\frac{1}{8}$ in. × $\frac{3}{16}$ in. (or $1\frac{1}{4}$ in. × $\frac{1}{4}$ in.) galvanised iron water tongue bedded in white lead.

$1\frac{1}{4}$ in. (or $1\frac{1}{2}$ in.) rounded (or moulded) window nosing, rebated to oak sill, with returned and mitred ends, and 2 in. × $1\frac{1}{4}$ in. returned and mitred moulding under, on narrow splayed grounds.

$2\frac{1}{2}$ in. (or 3 in.) × $1\frac{1}{2}$ in. moulded architrave, mitred at angles, on narrow splayed grounds.



Meeting Rails

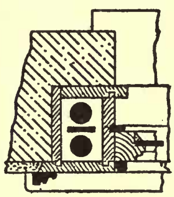


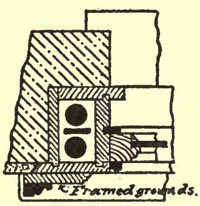
Fill in each frame with $1\frac{3}{4}$ in. ($1\frac{1}{2}$ in. or 2 in.) ovolo (lamb's tongue or otherwise), moulded, double hung deal sashes, rebated for glass, with splayed bottom rail, splayed (or rebated) meeting rails, and two moulded horns on each sash. Hang sashes with patent extra fine twine (flax) lines (or copper wire) over 3 in. brass-faced axle pulleys having 2 in. brass wheels, and balance with round cast-iron (or lead) weights. Provide with a 3 in. patent brass spring sash fastener, p.c. 2s. 3d., two brass sash lifts (state if flush) p.c. 1s. 6d. per pair, and two brass pull-down sash handles, p.c. 3s. per pair. Glaze sashes with 26 oz. clear sheet glass, bedded in putty and sprigged.

A deep bead is placed on the oak sill, to allow the lower sash to be raised so that air may pass through the meeting rails without the window being actually open.

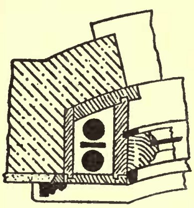
See clause No. 160 for windows to floors above.

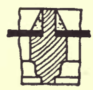
The inside linings may be splayed off to form a key for the plaster, instead of having the narrow splayed grounds at the back of the architrave. Sometimes wrought moulded framed grounds are fixed to the inside lining. The moulding under the window nosing is not always provided.



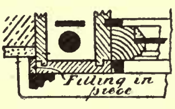


State if sashes, frames and architraves have segmental (semicircular or elliptical) heads, or if to similar sweeps on plan; also state if sashes be divided into small squares with moulded bars. See notes to clause No. 170 for size of bars.

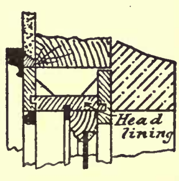




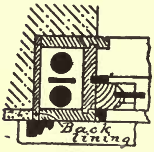
In a 9 in. wall, with sashes 2 in. thick (or more), the back lining would slightly show out from the face of the plaster; in that case, unless the back lining be thick, a small filling-in piece would be required round the frame.



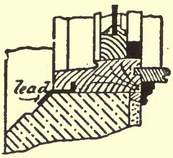
A parting bead may be put to a head lining, which would then be grooved out to receive it.



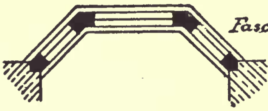
In inferior work the back lining consists of narrow strips of wood merely nailed across, and only some $\frac{3}{8}$ in. thick, but it is very poor work, although often done even in better class work.

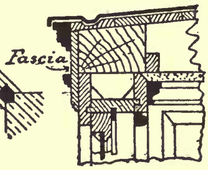


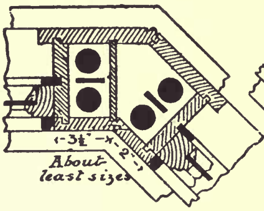
If a window opening have a brick sill, an iron tongue cannot be fixed in it, and water is liable to penetrate beneath the oak sill of the frame and cause dampness. A remedy for this is to put a piece of 4 lb. (5 lb. or 6 lb.) lead flashing, worked into a groove in the oak sill, and projecting slightly over the brick sill.

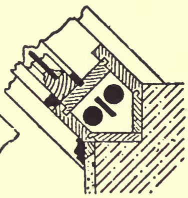


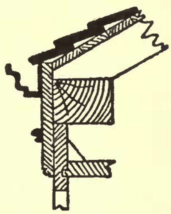
When a bay window is formed with cased frames showing entirely to the weather, without brick or stone piers, the window may be framed up as sketch. A staff bead may be worked on the angles. Mention the 1 in. wrought beaded (or moulded) fascia, with any necking or cornice mouldings planted on. The sill may be moulded. The lintels, flat joists, plates, rafters, boarding and covering may be described here. If the bay be slated or tiled, the cornice moulding might be an iron gutter.



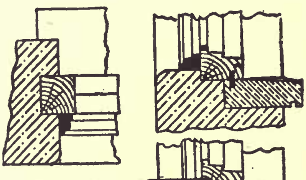






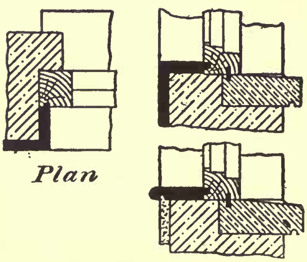


When frames are built in walls, finished on the inner side either in plain or glazed brickwork instead of with plastering, the linings may be omitted altogether, but a small moulding should be described round the inner side of the frames as a finish, see Bricklayer, notes to clause No. 89. A window board may or may not be required.

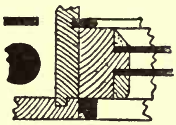
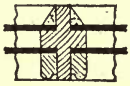
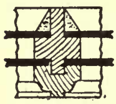


Plan

The elbows, head and sill may have cement linings worked into a groove in the frame, with the arris slightly taken off, see Plasterer, clause No. 50. A deal window board may be provided instead of a cement sill lining.

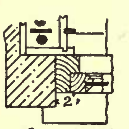


Plan

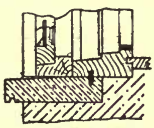




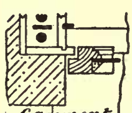
When sashes are required to be double glazed for warmth, the outer thickness of glass may be sprigged and puttied, and the inner thickness bedded in putty and fixed with loose beads, with a small space left in between the two sheets of glass from $\frac{1}{8}$ in. to 1 in., according to the thickness of the sash. Sash bars to this class of glazing must be of some width, to which the loose beads may be fixed, but if the bars be required somewhat thin, then a rebated moulding may be fixed instead of the loose beads. Also see notes to clause No. 170 for size of bars.

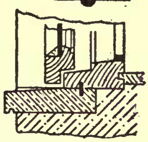
To existing windows, as a precaution against cold, casements either with or without frames may be placed on the outer side. The sketches will show two methods. The casements may be similar to any of those shown in clause No. 170. If the outer casements be required without a separate frame, state that the hinges are to be secured to wood blocks fixed in the outer reveals. In outer casements with frames, the timber frame need only be of sufficient thickness to take the screws of the hinges.



Casement with frame




Casement without frame

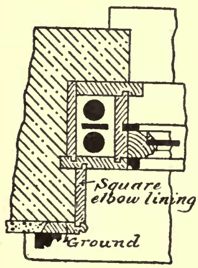


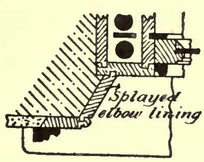
Larder windows. See clause No. 153.

W.C. windows. See clause No. 154.

Simple cased frames with elbow and soffit linings in 14 in. (or thicker) walls.

(145)—Fill in each window opening to basement and servants' offices with wrought deal cased frames having:—





1 in. grooved outside linings.
1 in. twice grooved inside linings, with 1 in. (or $1\frac{1}{4}$ in.) $\times$ $\frac{3}{4}$ in. inside bead planted on.
$1\frac{1}{4}$ in. twice rebated and grooved pulley styles, with pocket pieces for access to weights, and $\frac{3}{4}$ in. (or $\frac{1}{2}$ in.) parting beads.
2 in. twice rebated head lining, blocked out and with bead planted on.
$\frac{3}{4}$ in. rebated back linings.
$\frac{1}{2}$ in. parting slips (or 16 gauge zinc slips).
3 in. twice sunk, twice weathered and check throated oak sill, grooved for iron tongue and window nosing (or window board), with bead $1\frac{1}{2}$ in. deep planted on for ventilation, and $1\frac{1}{8}$ in. $\times$ $\frac{3}{16}$ in. (or $1\frac{1}{4}$ in. $\times$ $\frac{1}{4}$ in.) galvanised iron water tongue bedded in white lead.

$1\frac{1}{4}$ in. (or $1\frac{1}{2}$ in.) rounded (or moulded) window board on bearers, rebated to oak sill, with returned and mitred ends, and 2 in. $\times$ $1\frac{1}{4}$ in. returned and mitred moulding under, on narrow splayed grounds.

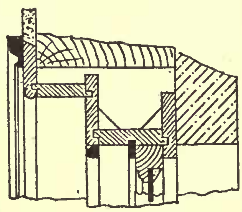
1 in. wrought deal, twice rebated, square (or splayed) elbows and soffit lining, tongued at angles, on backings, with an extra groove formed round the inside lining of frame to receive the elbows and soffit. The soffit lining to be kept sufficiently high to receive a roller blind.

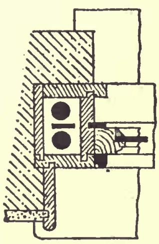
$4\frac{1}{2}$ in. $\times$ $\frac{3}{4}$ in. (or 1 in.) grooved, splayed, beaded (or moulded) grounds, with $2\frac{1}{2}$ in. (or 3 in.) $\times$ $1\frac{1}{2}$ in. moulded architrave, mitred at angles.

Then describe the sashes, glass and ironmongery, as in clause No. 144.

The architraves may be to any other size. See notes on architraves under clause No. 244.

The parting bead may be put to the head lining, which would be grooved out to receive it.





The linings to larders, pantries, and windows in similar positions, may be rebated, grooved and rounded, instead of being provided with grounds and architraves.

State if the head lining, architrave and grounds are to be to segmental (semicircular or elliptical) sweeps to follow any similar sweeps of the heads to sashes and frames. State if windows are to similar sweeps as plan. If circular-headed windows have square head linings, spandril pieces must be mentioned. State if the sashes are divided into small squares with moulded bars.

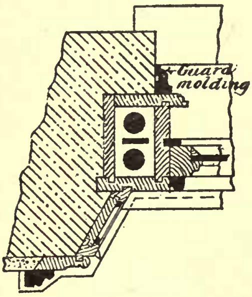
The classes of windows mentioned in clauses Nos. 144 and 145 are suitable for all ordinary positions in any ordinary building. If panelled elbows, soffit or window back be required, see clause No. 146 and notes.

Cased window frames are often specified with a very short description, as in the following manner:—

> Fill in window openings in basement and servants' offices with deal cased frames, oak sunk, weathered and throated sills, 2 in. ovolo moulded sashes and so on, without mentioning the particular sizes and labours to each part; but it is the wrong way to describe work in so rough a manner, unless full-size details be provided, when of course the description may be curtailed.

Cased frames for the best class of work with panelled linings.

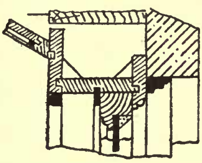
(**146**)—Fill in each window opening on ground and first floor with wrought deal cased frames having:—



$1\frac{1}{4}$ in. grooved and moulded outside linings.

1 in. twice grooved inside linings, with $1\frac{1}{4}$ in. × 1 in. inside moulded beading planted on.

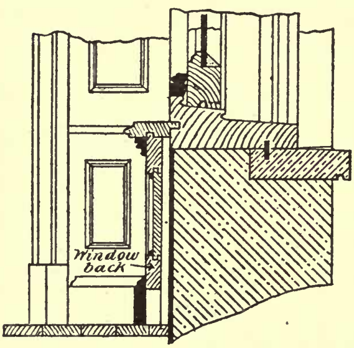
$1\frac{1}{2}$ in. twice rebated and grooved pulley styles, with pocket pieces for access to weights, and $\frac{5}{8}$ in. moulded parting beads (the pulley styles and beads are sometimes in oak, walnut or mahogany when the sashes are in a similar wood; the bead is then fixed with brass socket screws).



2 in. twice rebated, grooved and moulded head lining (state if splayed), blocked out, and with a $\frac{5}{8}$ in. moulded parting bead, and inside moulded beading planted on.

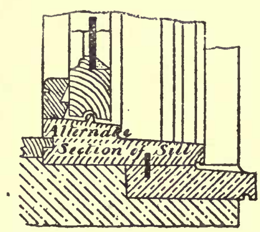
$\frac{3}{4}$ in. rebated back linings.

$\frac{1}{2}$ in. parting slips (or 16 gauge zinc slips).



$3\frac{1}{2}$ in. twice sunk, twice weathered, and twice check throated oak sill, grooved for iron tongue and window board (or window nosing), with a checked out moulded bead 2 in. deep planted on for ventilation, and $1\frac{1}{4}$ in. × $\frac{1}{4}$ in. galvanised iron water tongue bedded in white lead.

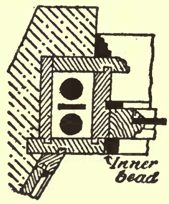
Here is an alternative method of forming the oak sill.



The frames are to project sufficiently beyond the outside reveals to take an $1\frac{1}{2}$ in. × 1 in. moulded deal (or oak) guard bead planted round the frame, and the oak sills to be sufficiently wide to stop this moulding.

Fill in each frame with 2 in. (or $2\frac{1}{4}$ in.) moulded double hung deal (oak, walnut or mahogany) sashes rebated for plate glass, with movable moulded beads and brass cups and screws, throated and splayed bottom rail, splayed (or rebated) meeting rails, with two moulded horns on each sash. Hang sashes with patent extra fine plaited twine (hemp) line (or copper wire), over 3 in. brass-faced axle pulleys having 2 in. brass wheels, and balance with cast lead weights, and provide with one 3 in. patent brass spring sash fastener, p.c. 3s., two brass flush sash lifts, p.c. 2s. per pair, and two brass pull-down sash handles, p.c. 3s. per pair. Glaze sashes with $\frac{1}{4}$ in. full (or thin) British polished plate glass, bedded in putty and wash leather.

The inside bead may be rebated on to the pulley style. State if sashes and frames are segmental (semicircular or elliptical) headed, and if sashes are divided into small squares with moulded bars.



Put $1\frac{1}{4}$ in. wrought deal, twice rebated, three (or more) panels high, moulded square (or splayed) elbows, and similar one-panel square (or splayed) soffit linings, tongued at angles, on skeleton framed dove-tailed backings, an extra groove being formed round the inside lining of frame to receive the panelling, and the soffit lining kept sufficiently high to receive a roller blind.

$4\frac{1}{2}$ in. × 1 in. wrought deal, grooved, sunk, beaded (or moulded) splayed grounds, with $3\frac{1}{2}$ in. × $1\frac{3}{4}$ in. moulded architrave, mitred at angles, with solid shaped plinth stops at foot the height of skirting.

$1\frac{1}{4}$ in. (or $1\frac{1}{2}$ in.) moulded deal window nosing, rebated to oak sill, and with an $1\frac{1}{2}$ in. × 1 in. moulding under.

$1\frac{1}{4}$ in. wrought deal three (more or less) panel moulded window back on backings, splayed to elbows, canvassed over and painted three times in oil colour at back.

Put 7 in. × $\frac{3}{4}$ in. moulded deal skirting on grounds, returning round the elbows, and finished with returned and mitred ends.

See Plasterer, clause No. 54, for rough rendering to brickwork at back of linings and window backs.

State if linings, window back or other parts be in oak, walnut or mahogany.

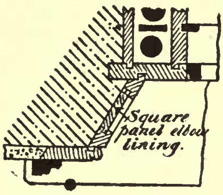
If the elbows be carried down only as far as the sill and not to the floor level, then no window back will necessarily be required; and instead of the window nosing, a window board on bearers would be described as rebated to the sill and elbows, with a small moulding under; and the architrave would not then necessarily have plinth stops. But if under these circumstances a window back be required, then the architrave must be taken down to the floor. The skirting round the window back is not always put.

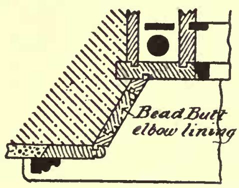
State if soffit linings, architrave and grounds are to be to segmental (semicircular or elliptical) sweeps, to follow any similar sweeps of the heads of sashes and frames.

State if windows are to circular sweeps on plan.

The architraves may be to any other size, see notes on architraves under clause No. 244.

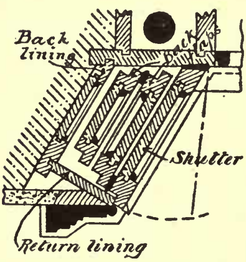
Panelled elbows, soffit linings and window backs would be equally applicable to a window of the description under clause No. 145 if the wall be thick. They need not necessarily be moulded, but simply square-panelled, and in that case 1 in. stuff would be sufficient; and if moulded, then bead butt or bead flush panels might be provided in these positions.



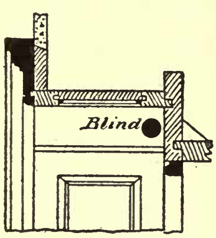


Windows with boxing shutters.

(147)—Describe the frame, the sashes, glass and ironmongery, either as in clauses Nos. 144 or 146, and then follow on with:—

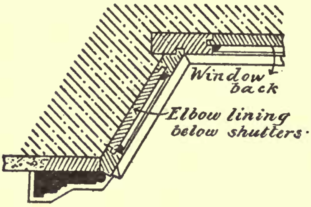


The shutters and back flaps to be $1\frac{1}{4}$ in. wrought deal, moulded and bead flush (or moulded and bead butt) three-panel high (more or less) framings, rebated and beaded together, and hung in one height, on one and a half pair of wrought-iron back flap hinges, and provided with two $1\frac{1}{4}$ in. diameter brass shutter knobs, and a shutter bar, p.c. 4s.



The soffit lining to be $1\frac{1}{4}$ in. wrought deal, moulded and square one-panel framing, rebated to a groove in window frame, tongued at angles, and fixed sufficiently high to receive a roller blind.

Form the splayed boxings with $1\frac{1}{4}$ in. wrought deal, moulded two-panel high back linings with backings, rebated to groove in frame, and grooved to a $\frac{3}{4}$ in. rebated return lining, with a $\frac{3}{4}$ in. beaded head and sill lining, with stops fixed on for shutters.



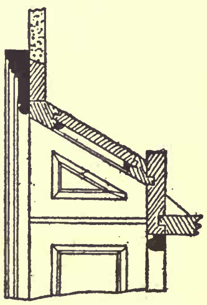
The window back to be $1\frac{1}{4}$ in. wrought deal, three (more or less) panel moulded framing on backings, canvassed and painted three times in oil colour at back, and grooved to $1\frac{1}{4}$ in. one-panel high moulded and rebated elbow linings below the shutters. Take 7 in. $\times$ $\frac{3}{4}$ in. moulded deal skirting on grounds round window back and elbows, and finish with returned and mitred ends. Put $1\frac{1}{4}$ in. (or $1\frac{1}{2}$ in.) rounded (or moulded) window nosing, rebated to groove in sill, and with an $1\frac{1}{2}$ in. $\times$ 1 in. moulding under.

The architrave to be $4\frac{1}{2}$ in. $\times$ $1\frac{1}{2}$ in. grooved, sunk, quirk beaded and moulded, mitred at angles and fixed to 1 in. splayed grounds, and finished with solid shaped plinth stops at foot the height of skirting.

State if shutters are hinged in two heights, with bead joint on one edge.

Shutter and back flap hinges may also be in brass or nickel plated. Shutter knobs may be in brass, iron, glass, china or wood; or flush shutter handles may be used instead. Shutter bars may be in iron, brass, nickel plated or of some patent kind.

The soffit lining to shutters is sometimes splayed to match the splayed boxings.

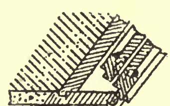


The back flaps are sometimes in bead butt or bead flush panelling, and if small in width, say up to 7 in. wide, then without panels at all; but they should then be clamped. The front flap is generally in moulded panelling, unless it be very narrow. In high-class work, both shutters and back flaps may be moulded on both sides, they then require to be $1\frac{1}{2}$ in. thick.

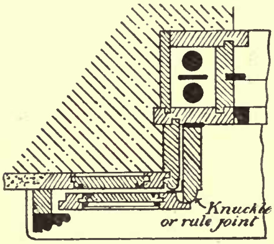
The elbow lining below the shutter need not be panelled if very narrow.

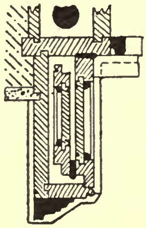
The back lining of boxings may be in plain wrought deal without panelling; and when space is a great object, the brickwork may be plastered over to form the back lining, dispensing with the wood lining.

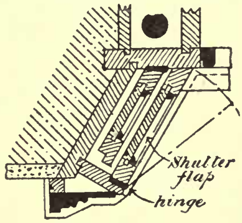
The small side return linings to the boxings are not always provided, and in that case the back linings of the boxings are rebated to the grounds of the architrave.



According to the thickness of a wall, and the space to be obtained for the shutters, so is the number of back flaps regulated. In a thin wall they must either fold back flat against the surface with a knuckle joint, or else the boxings must come out into the room considerably. The description would be modified accordingly.

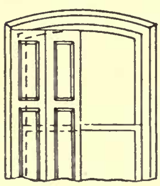






If it be desired not to show the interior of the boxings when the shutters are closed against the window, a shutter flap must be provided of a similar description to the shutters, but this is only required in very good work.

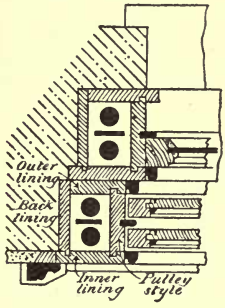
When the heads are segmental or elliptical, it is somewhat difficult to cover the entire height of the window with shutters, the boxings necessarily being the least height of the window, and the shutters can only be of the same height. But by keeping the architraves up as much as possible, the shutters can be made to cover the window space in very flat segmental or elliptical heads; otherwise lifting shutters must be adopted, or else the soffit lining and architrave must be square.



Windows with lifting sliding shutters.

(148)—Describe the sashes, frames, glass and ironmongery, similar to clauses Nos. 144 or 146, and follow on with:—

The boxings for lifting shutters to be formed with:—



1 in. grooved outer linings, with 1 in. × $\frac{3}{4}$ in. bead planted on.

1 in. twice grooved inner linings, with 1 in. × $\frac{3}{4}$ in. bead planted on.

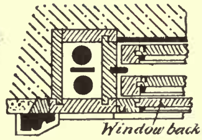
$1\frac{1}{4}$ in. twice rebated and grooved pulley styles, with pocket pieces for access to weights, and $\frac{1}{2}$ in. parting beads.

2 in. twice rebated and grooved head lining, blocked out, and with $\frac{1}{2}$ in. parting bead and 1 in. × $\frac{3}{4}$ in. beads planted on.

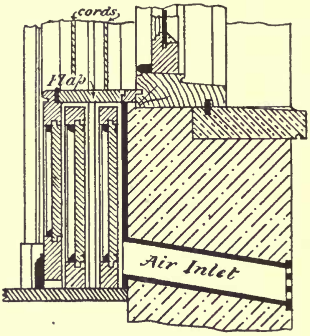
$\frac{3}{4}$ in. rebated back linings.

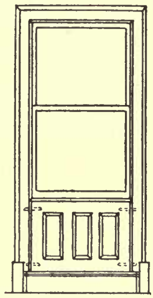
$\frac{1}{2}$ in. parting slips (or 16 gauge zinc parting slips).

3 in. × $1\frac{1}{2}$ in. moulded architrave mitred at angles, on narrow splayed grounds, with solid shaped plinth stop at foot the height of skirting.



$1\frac{1}{4}$ in. wrought deal three-panel (more or less) moulded, rebated and beaded movable window back, secured to boxings with four brass flush bolts for access to shutters; with 7 in. $\times \frac{3}{4}$ in. moulded skirting at bottom and an $1\frac{1}{2}$ in. flap at top, rebated to an $1\frac{1}{2}$ in. $\times 1\frac{1}{2}$ in. twice rebated horizontal piece fixed to a groove in the oak sill of window frame. The flap to be hinged to the window back with one pair of $2\frac{1}{2}$ in. brass butts, and provided with two $1\frac{1}{2}$ in. diameter flush rings and plates. The brickwork at back of shutters to be rendered over $\frac{3}{4}$ in. thick in Portland cement and sand.





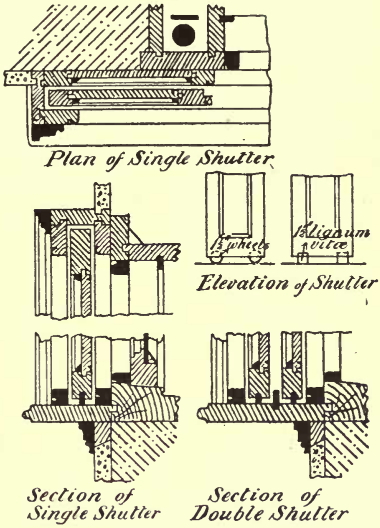
The lifting shutters to be $1\frac{1}{2}$ in. (or $1\frac{1}{4}$ in.) moulded and bead flush, three-panel (more or less) framings to each leaf, and hung with patent hemp (or twine) lines (or copper wire) over brass-faced axle pulleys having 2 in. brass wheels, and with cast lead (or iron) weights to evenly balance the shutters. Put two brass flush rings to each shutter for lifting, and two brass flush bolts for fixing.

The space into which the shutters drop should be ventilated with an air brick at the bottom, to prevent them twisting, this will also act as an air inlet to the room, which may be utilised by opening the small shutter flap. See Smith, clause No. 40, and Bricklayer, clause No. 57, for air bricks and flues.

Lifting shutters are especially useful when the windows are semicircular, segmental or elliptical headed; they also have the advantage, when being opened, of not interfering with the drapery of the windows, as is sometimes the case with boxing shutters.

If sufficient depth cannot be obtained under the window for lifting shutters to drop into, then shutters sliding horizontally may be used, but they are rather apt to get out of order.

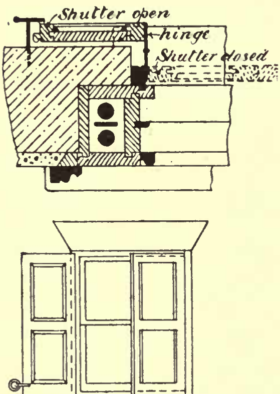
Here are some sketches showing how these shutters would be formed. The description would be similar to ordinary boxing shutters, but at the same time mentioning wheels in lieu of hinges. The runners may pre-



ferably be in oak. Instead of wheels, small pieces of lignum vitæ (a very hard wood) may be fixed to the bottom rail of shutters, thus doing away with the noise occasioned by wheels. See notes under clause No. 287, referring to sliding cupboard fronts.

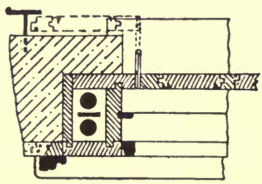
Windows with outside shutters.

(149)—Describe the frames, sashes, glass, ironmongery and finishings similar to clauses Nos. 144, 145 or 146, according to the requirements of the case, and continue on with :—



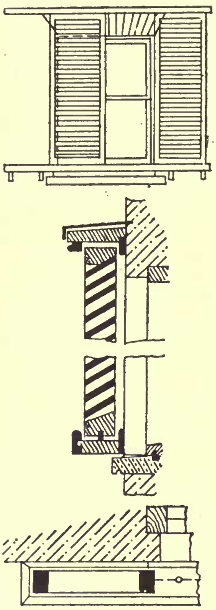
The outside shutters to be $1\frac{1}{4}$ in. (or $1\frac{1}{2}$ in.) two panels high, moulded and bead butt framings, with rebated and beaded meeting styles. Hang each shutter with one pair of $4\frac{1}{2}$ in. wrought-iron Parliament hinges to a 2 in. $\times$ 1 in. beaded fillet piece rebated to a groove formed in the outside lining of sash frame, the shutters to fold back against the outside face of the wall, and be secured when open by two wrought-iron shutter turns, and when shut with two 6 in. brass (or iron) barrel (or flush) bolts.

Parliament hinges are made to open $3\frac{1}{2}$ in., 4 in., $4\frac{1}{2}$ in., 5 in. and 6 in. Small wood blocks may be fixed to receive the hinges in lieu of a continuous outside fillet; or else the hinges may be fixed on to the outside lining of the sash frame, when, in this case, the outside lining of the frame should be at least $1\frac{1}{4}$ in. thick.



This class of shutter is mostly found in cottages.

Louvred or Venetian shutters are found in the better class of building, and may be hinged in exactly the same way, or else be made to slide horizontally. The advantage of louvred shutters is that they allow the air to pass when closed.



The description might run thus:—

Each window to the front of house on each story to be provided with wrought deal louvred sliding shutters formed with:—

2 in. ($2\frac{1}{2}$ in. or 3 in.) × $1\frac{3}{4}$ in. (or 2 in.) beaded styles, grooved for louvres.
2 in. ($2\frac{1}{2}$ in. or 3 in.) × $2\frac{1}{2}$ in. (or 3 in.) beaded and splayed top rail.
2 in. ($2\frac{1}{2}$ in. or 3 in.) × 3 in. (or $3\frac{1}{2}$ in.) beaded and splayed bottom rail with small brass wheels.
$\frac{3}{4}$ in. twice splayed louvres, placed at an angle of 30° (or 45°) 1 in. apart, and notched and housed into the styles. The runner (bottom guide) at foot to be in oak $1\frac{1}{4}$ in. thick, perforated every 9 in. apart with $\frac{1}{2}$ in. diameter holes to allow water to escape, and rebated to a 2 in. × $\frac{3}{4}$ in. grooved oak bead at front and ends and screwed to a 2 in. × $\frac{1}{2}$ in. oak bead at back (or else to a 2 in. × $\frac{1}{4}$ in. brass or gun-metal bar at back) and secured at each end to wall with two wrought-iron bracket supports, $\frac{3}{8}$ in. metal 2 in. wide (or else small shaped brackets), screwed to the oak and built 9 in. into the wall.

The top guide to be 2 in. thick, splayed and rebated with a $\frac{3}{4}$ in. × $\frac{3}{4}$ in. bead at front and ends, and a 2 in. × $\frac{1}{2}$ in. bead at back (or 2 in. × $\frac{1}{4}$ in. gun-metal or brass bar screwed on at back), and secured to wall in a similar way as the bottom guide.

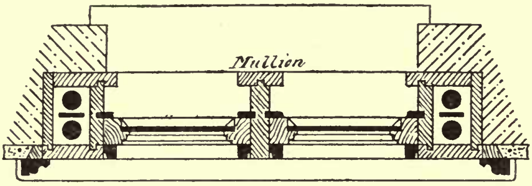
Flash over on top of guide with 4 lb. lead, wedged 1 in. into wall.

For effect, this class of shutter may be kept up clear of the arch. When closed, the shutter should be slightly wider than the width between the reveals. No bolts are absolutely required for fastening, as the shutters keep themselves in place. The meeting styles may be rebated and beaded. The top and bottom guides may be connected together with upright pieces at each end, thus forming a frame.

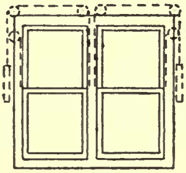
If the shutters be hinged, the top and bottom guides are not required, but the fastenings and hinges would be similar as to outside panelled shutters, and the meeting styles would be rebated and beaded.

Venetian cased frames.

(150)—The description of frames, sashes, glass linings, shutters and ironmongery, might be similar to



any of the clauses Nos. 144 to 148, with the addition of the centre mullion, which might be described as formed with :—

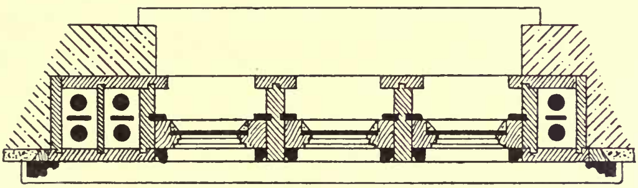


1 in. grooved (or grooved and twice moulded) outside lining.

$1\frac{1}{2}$ in. twice grooved and tongued centre guide, with $\frac{1}{2}$ in. (or $\frac{5}{8}$ in.) parting beads (or moulded parting beads) and 1 in. (or $1\frac{1}{4}$ in.) $\times$ $\frac{3}{4}$ in. (or $1\frac{1}{4}$ in.) inside beads (or moulded inside beads) planted on.

The sketches above show Venetian frames with two sets of sashes. State that each sash is to be hung from the one side by a series of pulley wheels placed in the head and side of the frame, attaching the lines to one weight, and that the cased frames are to be made sufficiently large to take these large single weights.

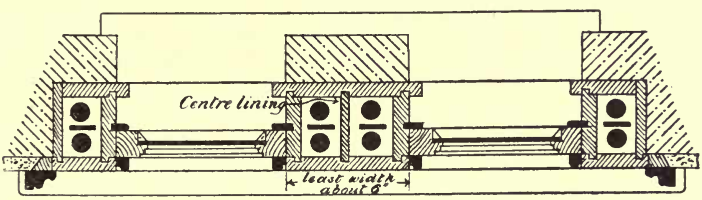
In the case of there being two mullions, with three sets of sashes,



the two side sets would be hung in the same way as a two-light window, and the centre set might have fixed sashes; but if desired this also may be made to hang in a similar way, by carrying the lines across the heads of the side sashes. There would then have to be a double boxing at one side to receive these weights, as shown in the sketch.

Cased frames with narrow outside brick or stone mullions.

(151)—When two or more cased frames are near together, divided by narrow outside mullions, and there is not sufficient width for them each to have entirely

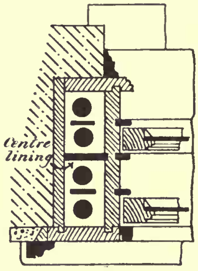


separate frames, then the windows may be all framed together as one frame: the description would remain exactly the same as with other cased frames, see clauses

Nos. 144 to 148; but those portions of the frames behind the mullions would require a centre lining $\frac{1}{2}$ in. thick housed into grooves in the outside and inside linings of the frames.

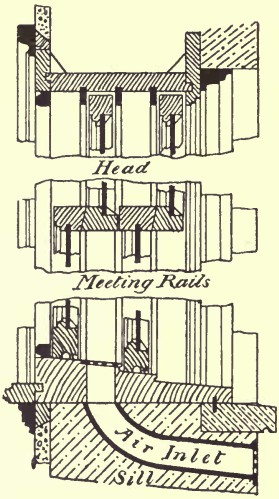
Double sets of cased frames.

(**152**)—The description might be similar to any of the clauses Nos. 144 to 151, with these modifications:—



$1\frac{1}{4}$ in. (or $1\frac{1}{2}$ in.) twice rebated and four times grooved pulley styles, with pocket pieces for access to weights, and three $\frac{5}{8}$ in. parting beads (or moulded parting beads).

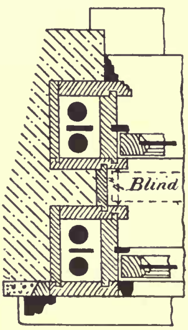
$\frac{3}{4}$ in. centre lining, housed into pulley styles.

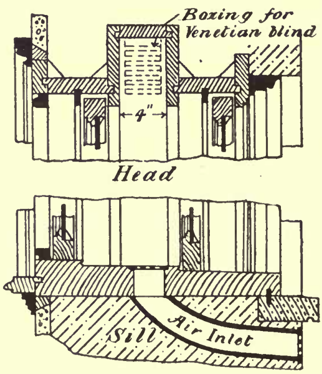


2 in. twice rebated and three times grooved head lining, blocked out, and with $\frac{5}{8}$ in. parting beads (or moulded parting beads), and inside beading (or moulded inside beading) planted on.

$3\frac{1}{2}$ in. (or 4 in.) thrice sunk, thrice weathered and twice check throated oak sill, grooved for iron tongue and window board (or window nosing), with bead 2 in. deep planted on for ventilation, and $1\frac{1}{4}$ in. × $\frac{1}{4}$ in. galvanised iron water tongue bedded in white lead.

When Venetian blinds are required to fall between two sets of double sashes, the sketches will show the method of framing; see notes to clause No. 177 for air inlets. For solid frames with casements under similar conditions, see clause No. 172.





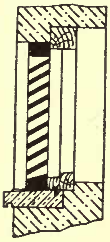
For cased frames inside with solid frames outside and Venetian blinds between, see clause No. 177. For Venetian blinds, see clause No. 161.

Meat and game larder windows with louvres and zinc or wire netting.

(**153**)—When the shelving comes across the windows, hung sashes become necessary, as casements would not open inwards on account of the shelving, nor outwards on account of the perforated zinc work.

Describe the sashes and frames, similar to clause No. 144 or 145, and continue on with:—Cover the outside of windows with No. 16 gauge finely perforated zinc, copper nailed to frame.

Galvanised iron, or copper wire fly netting may also be used. Larders should face the north or east; if facing the south or west, a louvred shutter outside becomes necessary to keep out the rays of the sun. It may be described as:—



Fix to the outside of each of the larder windows a louvred shutter, formed with 2 in. (or $1\frac{1}{2}$ in.) $\times$ 3 in. (or $2\frac{1}{2}$ in.) wrought deal beaded frame grooved for louvres, 3 in. (or $2\frac{1}{2}$ in.) $\times$ 3 in. beaded weathered oak sill, $\frac{3}{4}$ in. twice splayed louvres placed 1 in. apart at an angle of 30° (or 45°) and notched and housed into frame. See notes to clause No. 145, referring to larder windows.

W.C. windows.

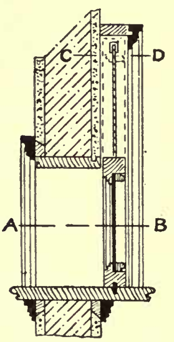
(**154**)—May be similar to clauses Nos. 144 or 145; but should be glazed with 21 oz. fluted sheet glass (or other kind of obscured glass).

Dormer windows.

(**155**)—These may either be cased frames and sashes, as clauses Nos. 144 or 145, or solid frames and casements, as clauses Nos. 170 or 171.

Inquiry or pay window.

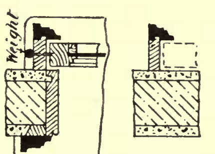
(**156**)—To be formed in wrought mahogany (or deal), with:—



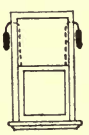
$1\frac{1}{2}$ in. (or $1\frac{1}{4}$ in.) moulded sash, glazed with 15 oz. fluted sheet glass in putty (or wash-leather and loose beads), and hung with hemp cords, lead (iron or gun metal) weights, round brass-faced axle pulleys having $1\frac{1}{2}$ in. wheels, and supplied with two 6 in. brass bolts, and one brass flush sash lift.

$1\frac{1}{4}$ in. rebated pulley styles and head, with $2\frac{1}{2}$ in. $\times$ $1\frac{1}{2}$ in. grooved and moulded architrave.

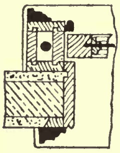
1 in. (or $1\frac{1}{4}$ in.) grooved and beaded linings, with a similar architrave on the outside on narrow splayed grounds.



Section through A.B. *Section through C.D.*

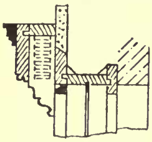


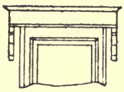
$1\frac{1}{4}$ in. moulded (or rounded) grooved window board with $1\frac{1}{4}$ in. $\times$ $\frac{1}{4}$ in. rounded gun-metal bar, and a $2\frac{1}{2}$ in. $\times$ $1\frac{1}{2}$ in. moulding under on each side on narrow splayed grounds.



The weights may fall into a boxing similar to a window boxing. The shutter may be a moulded panel instead of being glazed.

Blind box.





(157)—When a blind box is required to take a Venetian blind, it may be described as:—

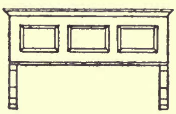
1 in. (or $1\frac{1}{4}$ in.) wrought deal rebated top, with small moulding planted round.

1 in. (or $1\frac{1}{4}$ in.) wrought deal, grooved and beaded (or staff beaded) front, with 1 in. (or $1\frac{1}{4}$ in.) cut shaped bracket ends, secured to wall with iron holdfasts screwed on.

A Venetian blind to a window 10 ft. high will draw up into a space of about 12 in. deep.

The brackets may be in iron or brass, the ends of blind box would then be similar to the fronts.

When the blind box is outside, the top may be covered with 5 lb. lead wedged into wall. If the window be of some considerable height, and the blind box consequently of some depth, the front may then be panelled out, and would be described as $1\frac{1}{4}$ in. (or $1\frac{1}{2}$ in.) three (or other) panel moulded and square framing, grooved and beaded, and with $1\frac{1}{4}$ in. (or $1\frac{1}{2}$ in.) cut shaped bracket ends secured to wall with iron holdfasts screwed on (or with plain return end pieces if there are metal brackets under).



Repairs to sashes and frames (or casements).

(158)—Cut out decayed and damaged portions of sashes (or casements), frames, sills and linings, and piece out with new. Put new parting beads. Nail up the loose inside beads. Hack out defective putty and reputty. Reglaze where cracked or broken glass with new. Put all new ironmongery (or relacquer ironmongery).

Glass screens to windows.

(159)—Similar to clause No. 165, but glazed with any kind of obscured, fluted or leaded glass, instead of the wire blind mentioned in that clause.

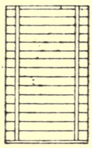
First and second floor cased frames, sashes, linings and shutters.

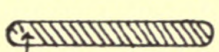
(160)—These may be similar to any of the clauses Nos. 144 to 152, 154, 157 and 159. If the building have additional stories, then the descriptions of the windows would also be similar.

Blinds.

(Clauses Nos. 161 to 167.)

Venetian blinds.





Lath quarter full size.

(161)—Put to all windows, inside Venetian blinds having $2\frac{1}{2}$ in. (or $2\frac{1}{4}$ in.) $\times \frac{3}{16}$ in. wrought pine laths with $2\frac{1}{2}$ in. (or $2\frac{1}{4}$ in.) $\times \frac{1}{2}$ in. top and bottom laths finished sizes, rounded on edges, painted three coats in oil colour and once varnished, and supplied with best cords, tapes (ladders), webbing, and brass (or nickel) fastenings. The blinds to be screwed up with 3 in. screws.

The laths may be plain varnished, or painted only.

See notes to clause No. 157 for least space into which Venetian blinds will draw up.

Repairs to Venetian blinds.

(162)—Take down all Venetian blinds, repair, re-tape, re-cord, and paint laths two coats in oil colour, once varnish, and refix (or else paint only and refix, or varnish only and refix).

Other inside blinds.

(163)—May be in white linen, with wood rollers, hemp cords, turned wood acorn tassels 2 in. long, and brass fastenings.

or,

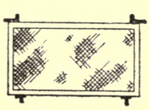
in white, buff, brown, blue, green or striped union Holland, with similar rollers, cords and fastenings.

If blinds have self-acting spiral spring rollers, the fastenings will not be required. Blinds under lantern lights may be in the various colours of Holland, and require lines, pulleys, cleats, guide-wires (or guide-rods), with spring rollers. The blinds may be painted three coats in oil colour to exclude more light. Blinds for conservatories may be in duck material.

Shop blinds.

(164)—See clause No. 315.

Wire blinds.

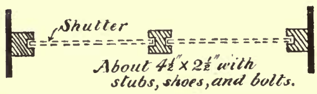


(165)—Put to ground-floor windows, painted wire blinds in French polished mahogany frames 1 in. (or $1\frac{1}{4}$ in.) thick, with brass bolts, stubs and plates. (Give the height, and state if fixed between the inside beads of frame or to the sashes themselves.)

Revolving shutters.

(166)—See clause No. 315 with notes.

Revolving shutters may be used to divide large rooms, or as a substitute for doors, or for the ordinary window shutters. In all cases the gearing must be accessible for oiling and repairs.



Repairs to old revolving shutters.

(167)—Take down revolving shutters, fittings and gear, repair, oil gear with neat's-foot (or olive) oil, and refix.

(168)—

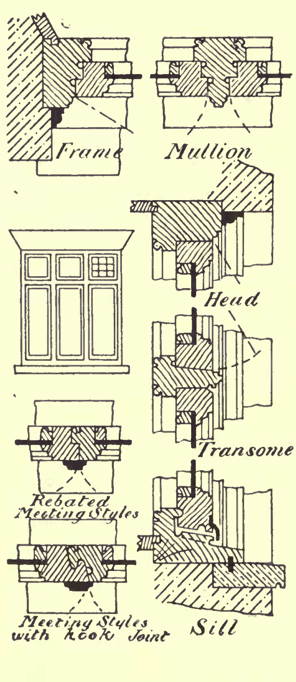
(169)—

SOLID CASEMENT FRAMES, WITH CASEMENTS.

(Clauses Nos. 170 to 178.)

Solid casements. Frames in good class work with casements hung to open outwards.

(170)—Fill in each window opening on ground and first floor with solid wrought deal framing, having:—



$4\frac{1}{2}$ in. × 3 in. ($3\frac{1}{2}$ in. or 4 in.) moulded and quirk beaded (or twice moulded), twice rebated and twice water-hollowed frame, with $4\frac{1}{2}$ in. × 3 in. ($3\frac{1}{2}$ in. or 4 in.) moulded and quirk beaded (or twice moulded) and once rebated head, and grooved all round for linings, with an $1\frac{1}{2}$ in. × 1 in. oak (or deal) guard moulding planted round on the outside.

$4\frac{1}{2}$ in. × 3 in. four times rebated, twice moulded and twice quirk beaded (or four times moulded), and four times water-hollowed mullions.

$4\frac{1}{2}$ in. × 3 in. (or $3\frac{1}{2}$ in.) sunk weathered, twice throated, rebated and twice moulded, and twice quirk beaded (or four times moulded) transome.

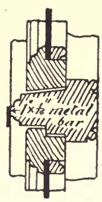
6 in. × 3 in. (or $3\frac{1}{2}$ in.) quirk beaded (or moulded), twice sunk, twice weathered, water-hollowed and check throated oak sill with rounded stop, and grooved for iron tongue and window board (or window nosing), and with an $1\frac{1}{8}$ in. × $\frac{3}{16}$ in. (or $1\frac{1}{4}$ in. × $\frac{1}{4}$ in.) galvanised iron water tongue bedded in white lead.

Fill in with 2 in. (or $2\frac{1}{4}$ in.) moulded casements, rebated all round for glass, with loose beads, brass cups and screws, and having twice rebated hanging styles, splayed, throated and hollow grooved bottom rail 4 in. deep, with $\frac{3}{16}$ in. brass (or gun-metal) water bar screwed on, rebated and beaded meeting styles (or beaded and hook jointed meeting styles), with moulded deal (or metal) stop screwed on. Glaze with 32 oz. sheet (or other) glass in putty. Hang each casement on one pair $3\frac{1}{2}$ in. brass butts, with gun-metal washers, and provide each leaf with two 6 in. brass barrel bolts and one brass casement stay, p.c. 3s., and one brass casement fastener, p.c. 2s. 6d., to each single or folding casement.

Fill in fanlight openings with similar framings and glass, each light being hung from the top on one pair $3\frac{1}{2}$ in. brass butts, with gun-metal washers, and provided with two brass fanlight stays, p.c. 2s. each, and one brass fanlight fastener, p.c. 2s. 6d.

Then describe the linings, shutters, boxings, architraves, window backs, boards or nosings, and other finishings similar as in cased frames, see clauses Nos. 144 to 149.

Should the weather find its way through the joint of the transome with the top rail of a casement, a small metal bar screwed on the transome will prevent it.

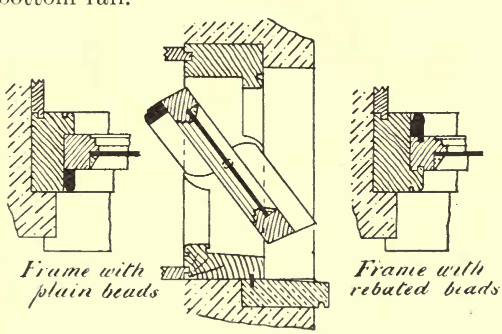


State if frames and casements be to a circular sweep on plan; if with segmental (semicircular or elliptical) heads put together with oak keys and wedges or pins (or with handrail screws). The glazing may be puttied and sprigged in the ordinary way, instead of being fixed with loose beads and brass cups and screws.

State if casements and fanlights be in small squares, giving the size of the bars, such as 2 in. × $1\frac{1}{4}$ in. (for 2 in. sashes), twice moulded and twice rebated bars. If loose beads be required, then the bars should be wider, say 2 in. × $1\frac{1}{2}$ in.

If double glazing be required, see notes to clause No. 144.

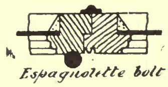
The fanlights may also be hung on butts, either at the side or on the bottom rail.



Frame with plain beads

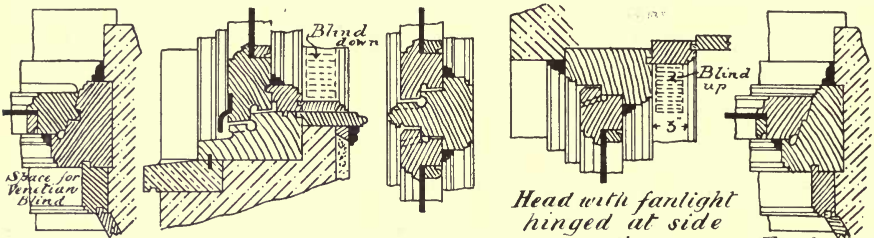
Frame with rebated beads

They may also be hung on brass (or gun-metal) centres with movable beads, lines, cleats and pulleys, but when on centres it is difficult to keep out the weather. The beads may be rebated both to the sash and the frame. A brass espagnolette bolt fastener may be fixed on either one of the folding casements instead of employing the small barrel bolts and casement fastener, when the casement would be grooved out to receive it. An excellent casement bolt and fastener is to be had in one fitting, the casements in this case also being grooved out to receive it.



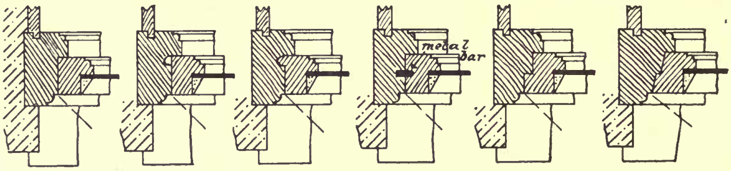
Espagnolette bolt

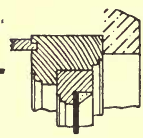
Here are some further details of casements with solid frames for high-class work:—



Frame *Sill* *Transome* *Head with fanlight hinged at side or top.* *Fanlight.*

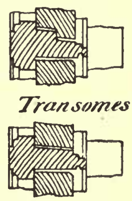
Here are some further details suitable for solid frames and casements in simpler work:—



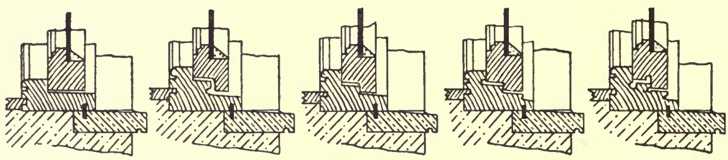


Head

Various Sections of Casement Frames

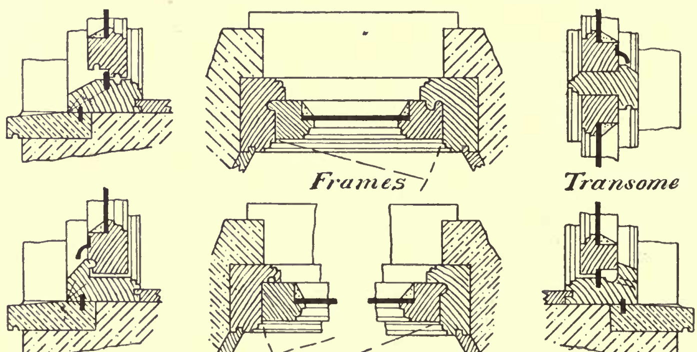


Transomes



Various Sections of Sills

Casements opening inside. (**171**)—It is somewhat difficult to make this class of casement weather-tight, but the accompanying sketches show some of the methods to be employed:—



Frames *Transome*

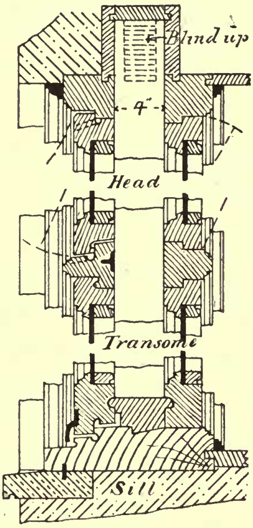
Sills *Sill*

If reversed, any of the sections shown under clause No. 170 for solid frames with casements opening outwards, may practically be adopted for inside casements, except the sills and transomes, which would be somewhat after those sketches. The external water bar may be put in any case.

With casements opening inside, state that the head lining is to be kept sufficiently up to allow of a roller blind.

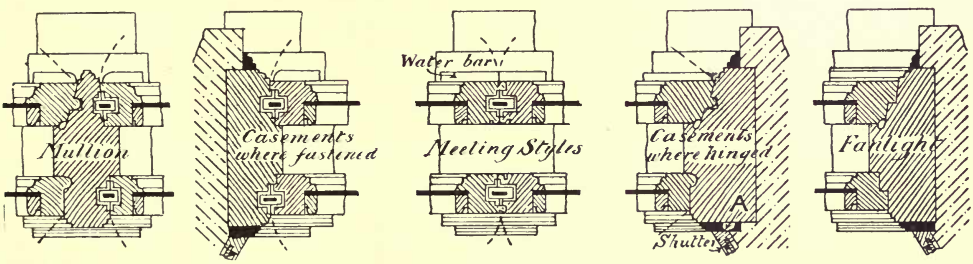
Double sets of solid frames and casements.

(172)—In the very best work sometimes double sets of casements are required.



Describe the frame, head, transome and sill to the increased width, somewhat similar to clause No. 170. Then describe the outer casements, fanlights, glass and ironmongery, and finally the inner casements, fanlights, glass and ironmongery, similar to clauses Nos. 170 and 171 respectively. The space between the outer and inner casements may be as little as 1 in. but if Venetian blinds be required to hang between the casements, the space should then be at least 4 in.

The outer transome being much cut away, a small tee iron stiffener may be described; but if the transome be fairly stout this will be unnecessary.



It will be seen from the sketches that the Venetian blinds will pull up entirely out of sight into a boxing, if the lintels above be kept up sufficiently high; describe this boxing as $1\frac{1}{4}$ in. grooved and tongued. See clause No. 161 and notes, for Venetian blinds.

For the linings, shutters, boxings and finishings, see clauses Nos. 144 to 149.

If the inner casements come flush or nearly flush with the inside face of the frame, and inside shutters are required, then a lining as at A must be provided upon which to hang the shutters, so that they may close clear of the casement handle; but if the inner casements be kept back some 1½ in. from the face of the frame, this lining will not then be necessary. If the fanlights open from the top or bottom, it will be seen from the sketches that the section will differ somewhat from that of the casements; but if they open from the side the section may be similar.

For air inlets, see notes to clause No. 177.

Bay window with solid frames and casements.

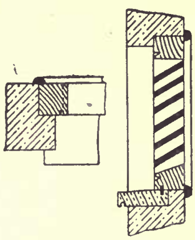
(173)—The description would be similar to clauses Nos. 170 to 172. For the fascia, linings, shutters, boxings and finishings, see clauses Nos. 144 to 148.

Solid frames and casements to W.C. windows.

(174)—These may be similar to clauses Nos. 170 or 171; the fanlight should open inwards for privacy, and the casements be glazed with 21 oz. fluted sheet or other obscured glass.

Louvred windows with wood (or glass) louvres.

(175)—This class of unglazed window is mostly used in outside w.c.'s, giving ventilation and light at the same time. The description may run:—



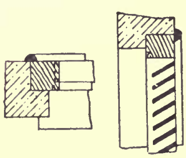
Fill in window openings to outside w.c.'s with 4½ in. × 3 in. wrought solid beaded frames, grooved for louvres.

4½ in. × 3 in. weathered, beaded and grooved oak sill, with 1⅛ in. × ¼ in. galvanised iron water bar, bedded in white lead.

1½ in. × 1 in. beading as architrave, planted round frame on the inside.

¾ in. deal twice splayed louvres, placed 2 in. apart at an angle of 30°, notched and housed into frame.

If the louvres be in ⅛ in. rolled close ribbed plate glass, they should be made movable in case of breakages, and the grooves for the movable glass louvres would stop short of the outside edge of the frame, to form the stop for the louvres.



For louvred windows to farm buildings, see clause No. 178.

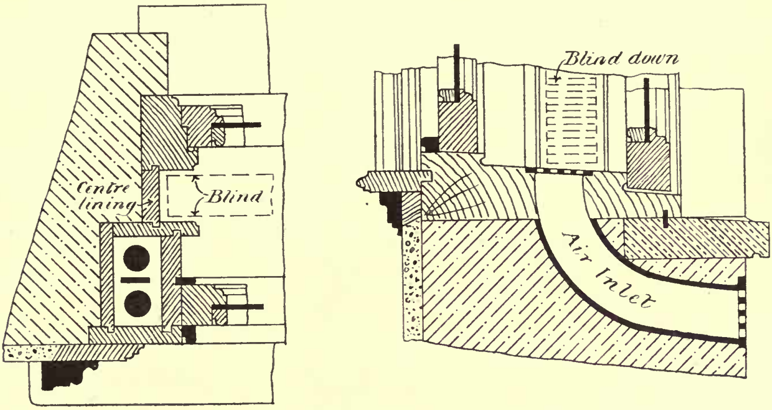
Outside casements fixed to existing windows.

(176)—See notes to clause No. 144.

Outside casements can only be fixed in front of solid casement frames when the existing casements open inwards, unless the outer casements can be opened from the outside.

Cased and solid frames combined, with Venetian blinds between.

(**177**)—The sketches will show how these windows may be formed. That part which is a cased frame, together with its finishings, might be described some-



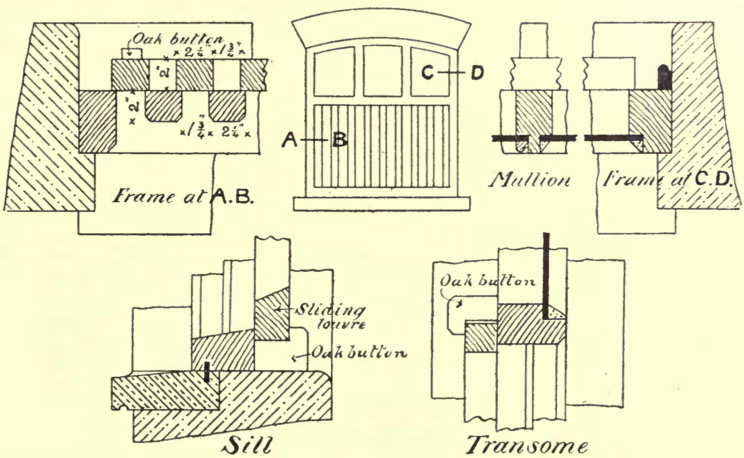
what similar to clauses Nos. 144 to 148, with an increased width to the sill, and the addition of an $1\frac{1}{2}$ in. twice rebated centre lining, and $1\frac{1}{4}$ in. head boxing forming the space for the Venetian blinds. The solid frames might be similar to clause No. 170.

With all double sets of cased frames, double sets of solid casement frames, or combined sets of cased frames and solid casement frames, air may be introduced between the outer and the inner lights by a flue, say 9 in. × $4\frac{1}{2}$ in., rendered in cement and finished externally with a 9 in. × 6 in. (or 9 in. × 9 in.) cast-iron grating, and internally at the oak sill level with a 12 in. (or 18 in.) × 4 in. hit-and-miss brass grating.

For Venetian blinds see clause No. 161.

Glazed windows with sliding louvres to farm buildings.

(**178**)—The sketches show how these may be framed.



The description may run:—

Each of the windows in cow-house to be formed with:—

4 in. (or $4\frac{1}{2}$ in.) × 3 in. solid wrought deal frames, heads, transomes and mullions, part chamfered (or beaded) and part rebated for glass, with 2 in. × $2\frac{1}{4}$ in. twice chamfered louvre bars.

4 in. (or $4\frac{1}{2}$ in.) × 3 in. oak weathered sill, grooved for and with an $1\frac{1}{8}$ in. × $\frac{1}{4}$ in. galvanised iron water tongue bedded in white lead.

2 in. sliding louvre framing, the bottom rail being splayed, and the framing sliding between oak buttons screwed to the sill and mullions, and provided with an oak rose handle.

Glaze the upper part with $\frac{1}{8}$ in. rolled close ribbed plate in putty and sprigged.

The glazing may be fixed with loose beads. A stop bead may be placed round the frame on the inside. The sliding louvres are often employed in farm buildings without the glazed upper portion.

Battening and Bracketing.

(Clauses Nos. 179 to 191.)

Battening for slated roofs.

(179)—See Slater, clauses Nos. 5, 6 and 12, with the notes to clause No. 6 in Slater.

Battening for stone-tiled roofs.

(180)—See in Stone Tiler, the notes to clause No. 1; and for the oak laths clause No. 1 in Stone Tiler.

Battening for tiled roofs.

(181)—See Tiler, clauses Nos. 2 and 3, with the notes to clause No. 2 in Tiler.

Battening to tiled or slated walls.

(182)—See Tiler, clause No. 10; and Slater, clause No. 13.

Battening for thatch.

(183)—See Thatcher, clause No. 1.

Battening on walls for plaster (or cement), internally and externally.

(184)—See Plasterer, clauses Nos. 48 and 65, with the notes to clauses Nos. 66 to 68 and 70 in Plasterer.

Battening on quartered partitions and bricknogged partitions for plaster (or cement).

(185)—See clauses Nos. 137 and 138.

Battening (brandering) to ceiling joists for plaster.

(**186**)—See Plasterer, clause No. 28.

Battening on beams for plaster.

(**187**)—See Plasterer, clause No. 10.

Battening on walls for wood panelling.

(**188**)—To be $\frac{3}{4}$ in. (to $1\frac{1}{2}$ in.) thick by 2 in. (to $2\frac{1}{2}$ in. or 3 in.) wide fir battens, spaced 2 ft. 6 in. (to 3 ft.) apart, plugged to walls, and where against flues secured with wall hooks. Also see clauses Nos. 205 and 206.

Battening on quartered and bricknogged partitions for wood panelling.

(**189**)—Same as clause No. 188. Also see clauses Nos. 138, 205 and 206.

Battening to ceiling joists for wood panelling.

(**190**)—Same as clause No. 188 if required, but secured to ceiling joists. Also see clause No. 208.

Brackets for cornices and coves.

(**191**)—See Plasterer, clauses Nos. 9 and 32.

Skirtings.

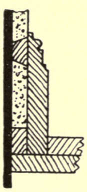
(Clauses Nos. 192 to 201.)

Clause No. 12 may perhaps preferably be inserted here.

Generally.

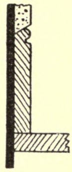
(**192**)—Grounds to be dovetailed at angles and plugged to walls. Skirtings to be tongued and mitred at angles, tongued together at heading joints, housed into architraves, and returned and mitred at ends.

Note.—The walls at back of skirtings are to be plastered (or cemented) flush with the grounds (see Plasterer, clauses Nos. 41 and 45).

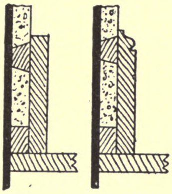


When there is double flooring, the upper one being in a hard wood such as in oak, then state that the skirting is to go behind the oak floor, and that the oak floor is to be scribed up to it; see clause No. 67.

When space is an object, wood skirtings may be flush with the plastering, fixed to plugs in the walls.



Attic skirtings.

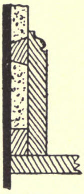


(**193**)—Run 7 in. × 1 in. wrought deal square (or moulded) skirting round all rooms and passages, fixed to one double splayed narrow and one plain narrow ground (plain fillet).

The lower ground may be splayed.

State if the skirtings to passages are to correspond with the wall strings of staircases, see clauses Nos. 217 and 218.

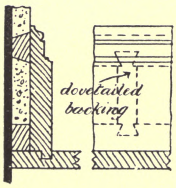
Second floor skirtings.



(**194**)—Run 9 in. × $1\frac{1}{4}$ in. wrought deal moulded skirting round all rooms and passages, fixed to one double splayed narrow and one plain narrow ground (plain fillet).

See remarks to clause No. 193.

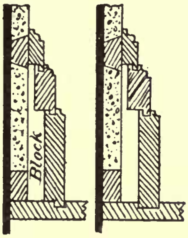
First floor skirtings.



(**195**)—Run 9 in. × $1\frac{1}{4}$ in. wrought deal moulded and sunk skirting round all rooms and passages, grooved and rebated (or housed) to floors, and fixed to one double splayed narrow and one plain narrow framed ground, with dovetailed backings every 15 in. apart.

See remarks to clause No. 193.

Ground floor skirtings.



(196)—Run wrought deal moulded and twice sunk skirting round all rooms, halls and passages 12 in. high, formed up in three pieces, $1\frac{1}{4}$ in., $1\frac{1}{4}$ in. and 1 in. thick respectively, grooved and rebated together and to floors (or housed to floors), and fixed to one double splayed narrow and one plain narrow framed ground, with dovetailed backings and filling out blocks every 15 in. apart.

See remarks to clause No. 193.

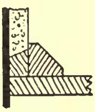
State if skirtings are in a hard wood, such as in oak, with deal grounds, backings and blocks; and that the skirtings are French polished.

Basement skirtings.

(197)—Run 7 in. × 1 in. wrought deal square skirting round all rooms and passages to boarded floors, fixed to one double splayed narrow and one plain narrow ground.

See remarks to clause No. 193.

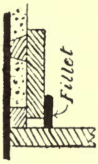
Angle skirtings.



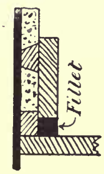
(198)—Run round all rooms and passages having wood block floors, wrought deal angle skirtings out of $2\frac{1}{2}$ in. × $2\frac{1}{2}$ in. stuff, with the edges taken off $\frac{1}{4}$ in., mitred at angles, returned and mitred at ends, screwed to floors, and with narrow splayed grounds against walls.

This form of skirting is more especially useful when the walls are not plastered, and of course grounds would not then be required. It is also suitable for warehouses.

Skirting fillets.

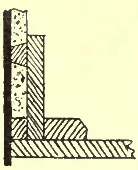


(199)—Run 2 in. × $\frac{1}{2}$ in. rounded deal skirting fillets to all rooms on second and attic (or other) floors, where skirting has shrunk away from the flooring, and paint the skirting and fillets three oils.



The space caused by the shrinkage may also be made out with fillets fitted in between, and painted over.

Bed boards.



(200)—Run 4 in. × 2 in. wrought deal chamfered bed boards round first and second floor rooms on two (or more) sides.

These bed boards prevent the walls being damaged by stopping the beds from being placed too near.

Cement skirting.

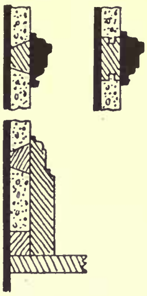
(201)—See clauses Nos. 52 and 53, under Plasterer.

Wiring casings for electric light.

(202)—See Electric Lighting, clause No. 17.

(203)—

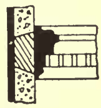
Chair or dado rail.



(204)—Run round dining room wall, 3 ft. from floor level, a 3 in. × $1\frac{1}{2}$ in. moulded deal chair (dado) rail, on double splayed narrow grounds (or double grooved narrow grounds), plugged to walls, with all mitres, irregular mitres, stopped and fitted ends, and ends on splay.

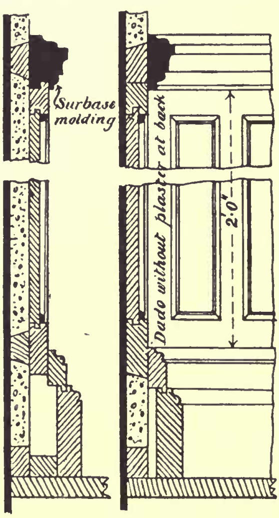
A chair rail is to prevent the backs of chairs damaging the plaster, and may be put in any similar position where there is likely to be rough usage, such as in servants' quarters and schools. A chair rail is not often more than 5 in. deep.

State if in oak or other hard wood, and whether carved or with dentil ornaments.



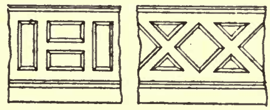
Dado.

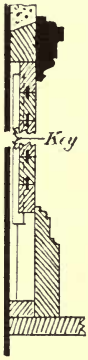
(205)—Form round walls of billiard room and dining room an $1\frac{1}{4}$ in. (or $1\frac{1}{2}$ in.) deal moulded one (or more) panel high dado, measuring 2 ft. in the clear between the skirting and surbase moulding, tongued and grooved at angles, and screwed to plugs in the walls (or screwed to 2 in. × $\frac{3}{4}$ in. horizontal battens plugged to walls, the plastering being filled in between the battens at the back of the dado). Plaster the walls where the dado comes against flues.



Then describe the surbase moulding (dado rail) as clause No. 204, and the skirting as clauses Nos. 196, 195 or 194.

State if dado be in irregular panels; if with carving to mouldings in panels; if in oak or other hard wood; if prepared for varnishing or polishing, which might be described with it.

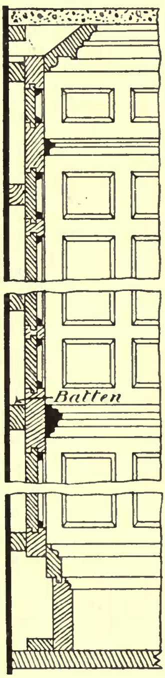




Dados may be formed with 1 in. (or $1\frac{1}{4}$ in.) plain wrought deal, grooved, cross-tongued and keyed boarding, with keys 3 ft. apart; and either plugged to walls or fixed to battens (see sketch).

Dados may also be formed with 1 in. (or $1\frac{1}{4}$ in.) wrought deal, V-jointed, grooved and tongued (or matched and beaded) boarding in 4 in. to 6 in. widths, and either plugged to walls or fixed to battens.

Wall panelling.

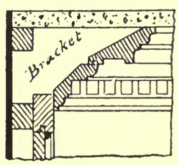


(206)—The walls and partitions of billiard room between the surbase moulding and frieze necking to be covered with $1\frac{1}{4}$ in. (or $1\frac{1}{2}$ in.) wrought deal three-panel high moulded framing, grooved and rebated together at angles, and screwed to 2 in. × $\frac{3}{4}$ in. horizontal fir battens placed every 3 ft. (or 2 ft. 6 in.) apart, plugged to walls.

Then describe the dado as clause No. 205, the surbase moulding as clause No. 204, and the skirting as clauses Nos. 196, 195 or 194. The frieze to be formed in $1\frac{1}{4}$ in. (or $1\frac{1}{2}$ in.) wrought deal one-panel high moulded framing, with 2 in. × 1 in. necking moulding, and cornice moulding out of 5 in. × $1\frac{1}{2}$ in. on brackets secured to a fillet plugged to walls, with all mitres, irregular mitres, stopped ends and ends on splay.

Plaster the walls where the framing comes against flues.

State if walls are to be plastered behind the framing between the battens; but it is better to allow the air to circulate around at the back.

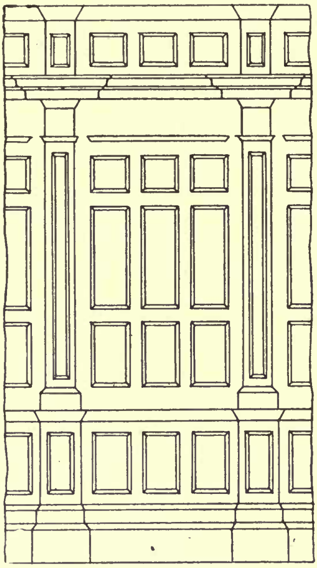


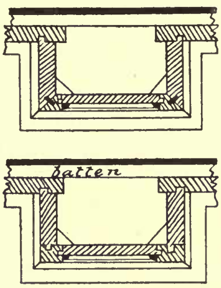
The cornice may be built up if very large.

State if there be any carving to mouldings of panels or cornice; if there be any dentils; if the work be in oak or other hard wood; if prepared for varnishing or polishing, which might be described with it.

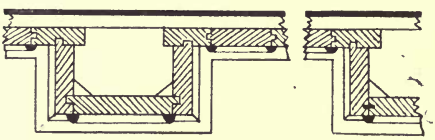
The "filling" may be in 1 in. (or $1\frac{1}{4}$ in.) V-jointed, grooved and tongued (or matched and beaded) boarding in 4 in. to 6 in. widths (prepared for varnishing, if varnished); and the frieze might be a plain horizontal board.

In walls with panelling and pilasters, the description of the wall panelling, dado, cornice and other mouldings would remain similar to the description in this clause; then describe the pilasters, either straight or diminished, as 1 in. ($1\frac{1}{4}$ in. or $1\frac{1}{2}$ in.) moulded panelled fronts, tongued and mitred at angles to plain sides, glued and blocked together, and rebated to grooves in the panelling. Then describe the bases, caps, necking and any other work, such as dentils, carved mouldings, flutes to pilasters, or carved caps. The pilasters may be tongued and grooved together.



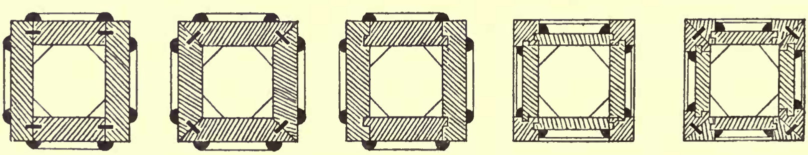


A cheaper way of forming wall and dado panelling is by tonguing and grooving the boarding together, and covering the joints with raised mouldings. If this form of framing be in oak or other hard wood, 1 in. thickness will do.



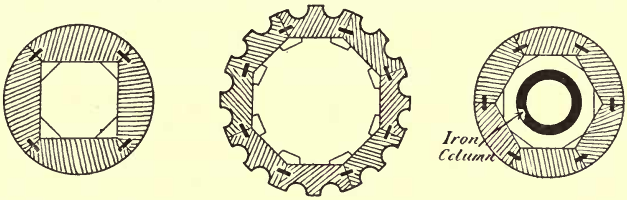
Square columns.

(207)—Here are a few details of square wood columns; the description would be somewhat similar to pilasters, as in clause No. 206, the thickness of the framing being about the same.



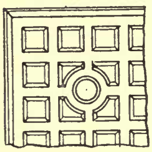
State if with diminished shafts or with carved caps.

Circular columns. Here are a few details of circular wood columns; they would be described as being turned and built up. The thickness of the framing would vary according to the number of pieces of which it was formed.



State if with diminished shafts or with carved caps. When strength is required, an iron column may be placed down the centre, either in the case of a square or circular built up wood column.

Ceiling panelling. (208)—Fir up ceiling joists level, and line the ceiling of billiard room with $1\frac{1}{4}$ in. (or $1\frac{1}{2}$ in.) deal, moulded, square panelling screwed to the joists, and with circular panels ranged around the ceiling light.

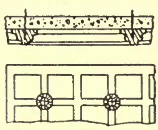


The firring up may take the form of battening, see clause No. 190. State if in irregular panels, if circular or polygon shaped, if in oak or other hard wood, and if with carved mouldings. State if prepared for varnishing or polishing, which might be described with it.

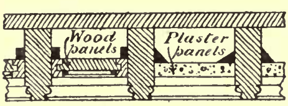
Then describe the cornice, as in clause No. 206.

Ceilings may be lined with panelled framing formed with raised mouldings similar to that described to walls, as in the notes under clause No. 206.

Ceiling ribs. (209)—Panel out the plaster ceiling with 2 in. × 3 in. deal moulded ribs, screwed through to joists, with all mitres and intersections.

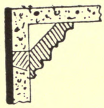


State if in oak or other hard wood; if in irregular panels; if circular or polygon shaped; if with carved mouldings; and if with ornamental carved bosses at the intersections. The painting, varnishing or polishing may be described here. Then describe the cornice, as in clauses Nos. 206 or 210.



Sometimes the joists are moulded in the solid, with cross timbers of similar thickness placed between to form the panels. The panels may be filled in with lath and plaster on fillets, or wood panelling on fillets.

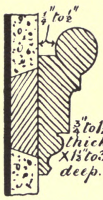
Plain deal cornices to rooms.



(**210**)—Run round servants' rooms in basement, deal cornices out of 5 in. × $1\frac{1}{2}$ in. stuff, screwed to the ceiling joists above and to brackets secured to narrow splayed grounds in the walls. Form all mitres, irregular mitres, stopped ends and ends on splay.

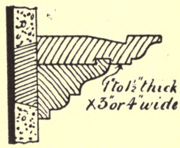
The cornice, if deep, may be built up as in the notes to clause No. 206.

Picture rail.



(**211**)—Form round walls of reception rooms 3 in. × $1\frac{1}{2}$ in. moulded and grooved deal picture rails, screwed to double splayed narrow grounds plugged to walls.

Picture rails take the place of picture rods, but are continued right round the room. Plaque and plate rails may be as sketch.



Picture rods.

(**212**)—Put to each separate length of walling in dining room, drawing room and billiard rooms, 1 in. brass-cased picture rods, with cone-shaped ends, slip joints, driving (or plate) brackets, and sliding eye-hooks.

Put similar $\frac{7}{8}$ in. brass-cased rods and fittings to first floor three best bedrooms.

Put similar $\frac{3}{4}$ in. brass-cased rods and fittings to other first floor bedrooms.

Put similar $\frac{3}{4}$ in. iron picture rods and fittings to servants' rooms in basement, and paint two oils.

Iron and brass-cased picture rods are made $\frac{1}{2}$ in., $\frac{5}{8}$ in., $\frac{3}{4}$ in., $\frac{7}{8}$ in. and 1 in. diameters.

Portiere rods.

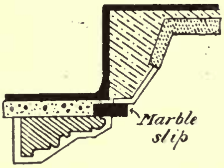
(**213**)—Allow the sum of £1 for brass portiere rods to each of the three reception room doors.

Curtain rods.

(**214**)—May either be cased in brass or else of some hard wood from 2 in. to $3\frac{1}{2}$ in. diameter, with ornamental ends, rings and brackets.

Wood chimney-pieces and overmantels.

(**215**)—Allow a p.c. sum for each, and state they are to be fixed to the brickwork with cramps or wall hooks, and supplied with $\frac{3}{4}$ in. (or 1 in.) × 3 in. polished marble slips round the fireplace opening.



The marble slips act as a protection to the wood against the heat from the stove. State the class of marble.

For other chimney-pieces see Mason, clauses Nos. 53 and 124; Smith, clause No. 74; and Slater, clause No. 18.

V-jointed or matched and beaded boarding to stable walls and ceilings.

(**216**)—Line round walls of harness room with 1 in. (or $1\frac{1}{4}$ in.) wrought deal, V-jointed, grooved and tongued (or matched and beaded) boarding in 7 in. (or less) widths, secured to $2\frac{1}{2}$ in. × $\frac{3}{4}$ in. fir battens spaced 2 ft. 6 in. apart, plugged to walls, and finished with a 7 in. × $1\frac{1}{4}$ in. plain deal (or 9 in. × $1\frac{1}{4}$ in. moulded) skirting on grounds.

Line ceiling of stables and harness room with similar boarding, spiked to joists, and finished with an 1 in. staff bead against walls.

Stop up nail holes, stain, twice size and twice varnish.

V-jointed or matched and beaded boarding to any other position would be described similarly.

Boarding to stall and loose box divisions.

See Smith, clause No. 109.

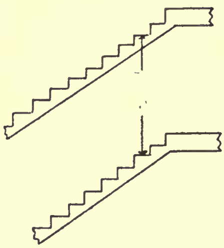
Staircases in Wood.

(Clauses Nos. 217 to 228 and 231.)

Stairs should not have a less width than 9 in. between the nosings, or a rise of more than 7 in. The wider the tread the less should be the rise, and the greater the rise the less the tread. Approximately speaking, the width of a tread multiplied by the rise should equal from about 60 in. to 66 in. A very useful width of tread is 11 in., with a rise of 6 in. An ordinary staircase should not be less than 3 ft. in breadth, 3 ft. 6 in. to 4 ft. is preferable, and 5 ft. makes a very good staircase. According to the requirements of the situation, they may be made as much as from 10 ft. to 12 ft. in breadth, and even greater (but see notes preceding clause No. 46 with reference to the widths of passages and staircases requisite for the number of persons to be accommodated). Winders are bad in any case, but if absolutely necessary, then they should be at least 9 in. in width at about 16 in. away from the handrail. A landing space should be provided to about every fourteen steps. There should never be less than two steps in any one position, one step alone being somewhat dangerous.

The height of the top of the handrail immediately above the risers is usually about 2 ft. $7\frac{1}{2}$ in., but 2 ft. 5 in. is better. On landings the handrail may be 3 ft. high.

Care must be taken that there is sufficient head room when one flight of stairs comes over another. A rough rule may be taken as 7 ft. 6 in. or 8 ft. 0 in. between the levels of the treads.

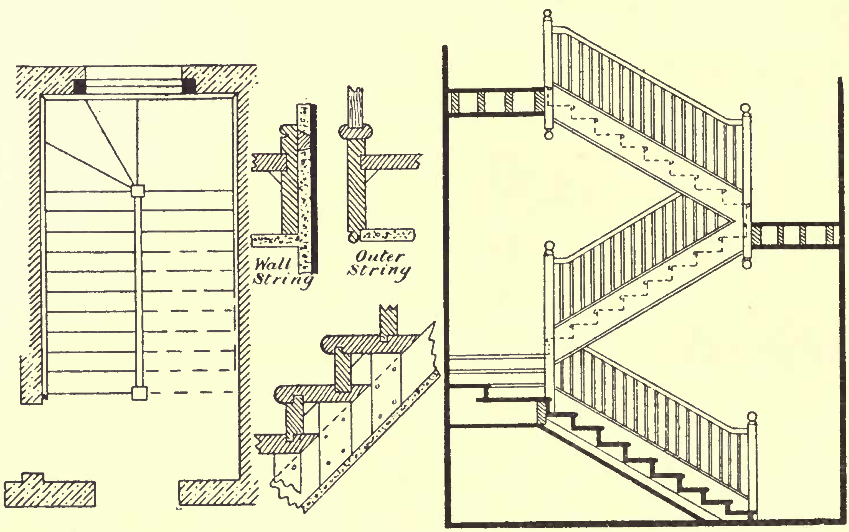


The commonest class of staircase is a "dog-legged" staircase; the better class is that with a "well-hole." A dog-legged staircase does not allow the light from a skylight to penetrate below, but in a staircase with a "well" this advantage is obtained. In all staircases let there be abundance of light. Borrowed lights to a staircase may be found useful either for lighting the staircase itself or the passages adjoining.

Dog-legged staircase.

(**217**)—The servants' staircase from basement to top floor to be 3 ft. clear breadth between the strings, and to be formed with:—

$1\frac{1}{4}$ in. wrought deal, twice grooved treads, 9 in. wide between the nosings, with rounded (or moulded) nosings, and housed into wall and outer strings.



1 in. wrought deal, twice rebated risers, glued and blocked to treads, housed into wall and outer strings, and bracketed to carriages.

The winders to be formed in a similar manner to the treads and risers, with strong bearers plugged into walls, and two dovetailed cross bearers to each tread.

$1\frac{1}{2}$ in. wrought deal beaded (or moulded) wall strings plugged to walls, with ramps, heading joints, tongued and mitred angles, fitted ends and returned and beaded (or moulded) ends, and carried round the landings as a skirting fixed on grounds.

$1\frac{1}{2}$ in. wrought deal rebated and beaded close outer strings, standing 3 in. above the nosing line of treads, housed into newels, prepared for plastering, and finished with a twice beaded capping on top.

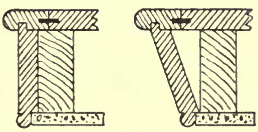
7 in. × 3 in. rough fir carriages framed into trimmers, two carriages being supplied to each flight. (The size varies as to length of flight.)

The newels to be turned out of 4 in. × 4 in. wrought deal, with turned ball tops and consoles, and framed to trimmers and strings.

3 in. × $2\frac{1}{2}$ in. moulded deal (or mahogany) handrail fitted together in long lengths with handrail screws, ramped, kneed, and housed into newels and wall (and French polished if in mahogany).

The handrail is to be placed 2 ft. $7\frac{1}{2}$ in. above the nosings at riser line, and at 3 ft. on landings.

1 in. (or $1\frac{1}{4}$ in.) deal square bar (or $1\frac{1}{2}$ in. turned) balusters every 4 in. apart, housed into handrails, strings and landings.



Square and splayed Apron linings

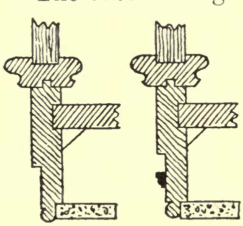
1 in. (or $\frac{3}{4}$ in.) rebated and beaded apron linings, with 4 in. × $1\frac{1}{4}$ in. grooved, rounded (or moulded) nosings tongued to landings. (State if the aprons are splayed so as to give more head room.)

The quarter space landing to be in $1\frac{1}{4}$ in. glued and tongued boarding, with strong joists plugged into walls.

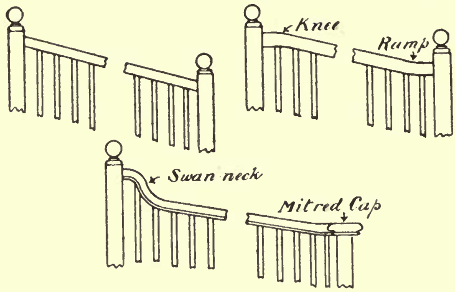
Then describe the half space and other landings, with their joists and flooring.

See remarks upon stair-eyes and carriages in the notes under clause No. 218.

The outer strings may be rebated, sunk and beaded, with a moulded capping on top; as also with a moulding planted on the face. A "well-hole" staircase may have "close" outer strings with newels, instead of "cut" outer strings, as described under clause No. 218.



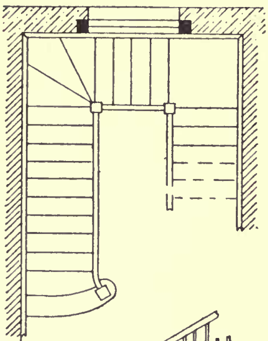
In very poor work the handrails are simply housed into the newels, without ramps or knees, see sketch on next page; but in any case

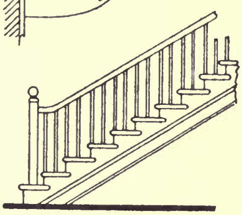


they should be ramped, as it prevents the hand being jammed in between the rail and the newel when coming downstairs. The handrail may be finished with mitred newel caps, instead of being housed into the newels. State if swan necks are required.

Principal staircase with "well-hole" and newels (clauses Nos. 218 to 221).

(218)—The principal staircase from hall on ground floor to second floor to be 3 ft. 6 in. clear breadth between the wall strings and handrail, and formed with:—



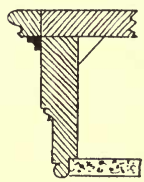


$1\frac{1}{4}$ in. (or $1\frac{1}{2}$) in. wrought deal twice grooved treads, 11 in. wide between the nosings, with moulded nosings and a small moulding under; cut and mitred return nosings with moulding under at outer ends, and treads housed into wall strings.

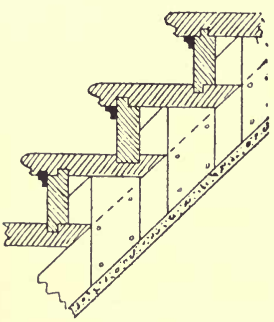
1 in. (or $1\frac{1}{4}$ in.) wrought deal risers, rebated to treads, glued and blocked together, bracketed to carriages, housed into wall strings, and cut and mitred to outer strings.

The winders to be formed up in a similar manner to the treads and risers, on strong fir bearers plugged into walls, with two dovetailed cross bearers to each tread.

Form two (or one) solid moulded curtail steps, with veneered risers and scroll ends.



$1\frac{3}{4}$ in. (or 2 in.) solid wrought deal rebated, sunk, moulded, beaded, cut and mitred outer strings, housed into newels and prepared for plastering.

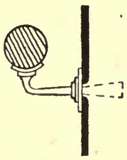


$1\frac{3}{4}$ in. ($1\frac{1}{2}$ in. or 2 in.) moulded wall strings, plugged to walls, with all ramps, heading joints, fitted ends, returned and moulded ends and tongued and mitred angles, and carried round the landings as a skirting fixed on grounds.

7 in. × 4 in. rough fir carriages, framed into trimmers, two carriages being supplied to each flight. (The size varies as to length of flight.)

5 in. × 5 in. turned newels, moulded on corners, with turned ball tops and consoles, and framed to trimmers. Take $\frac{3}{4}$ in. gas barrel up the centres, and finish with gas standards p.c. (say) £1. 10s. each.

3 in. × $2\frac{1}{2}$ in. French polished moulded mahogany handrails, fitted together in long lengths with handrail screws, ramped and kneed, and housed into newels. The handrail to be placed 2 ft. 5 in. (or 2 ft. $7\frac{1}{2}$ in.) above level of nosings at riser line, and at 3 ft. on landings.



Run a 2 in. diam. French polished mop-stick mahogany handrail along the wall side of staircase, with all ramps, handrail screws and turned ends, and secured with cast-iron (or brass) brackets built into walls and screwed to handrail.

$1\frac{3}{4}$ in. (2 in. or $1\frac{1}{2}$ in.) turned deal balusters, moulded at corners, dovetailed into treads and landings, and housed into handrails. Each tread to have two balusters, curtails one (or more), and on landings spaced every 4 in. apart. (If there be no newels, then the winders would each require one or more balusters.)

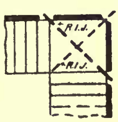
The quarter space landings to be in $1\frac{1}{4}$ in. (or $1\frac{1}{2}$ in.) glued and tongued boarding, with strong joists plugged into walls.

Then describe the half space landings and other landings, with their joists and flooring.

$1\frac{1}{4}$ in. rebated, sunk, moulded and beaded apron linings, with 4 in. × $1\frac{1}{4}$ in. (or $1\frac{1}{2}$ in.) grooved, moulded nosings with moulding under, and tongued to landings. (State if the aprons are splayed so as to give more head room.)

State if a pair of brass stair-eyes are to be provided to each tread, at p.c. 6d. to 1s. per pair.

The size of the carriages may be made the same as bridging joists of similar spans, and may be placed from 12 in. to 18 in. apart.

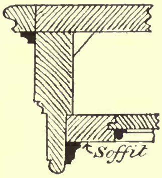


Quarter space landings may be strengthened with two small rolled iron or steel joists built in the walls, see sketch.

For a continuous outer string and handrail, see notes under clause No. 220.

If the soffits be boarded instead of plastered, see clause No. 219.

Soffits.



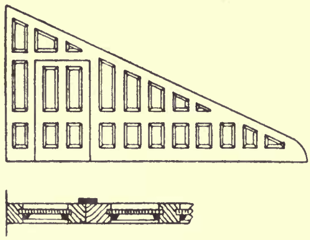
(219)—The soffits to be 1½ in. deal moulded and square-panelled framing, screwed to carriages and strings, and finished with a small moulding against the walls and the outer strings.

or,

The soffit to be 1¼ in. V-jointed, grooved and tongued deal boarding, finished with a small moulding against the walls and outer strings. (If varnished, then it should be secret nailed.)

Spandril framing.

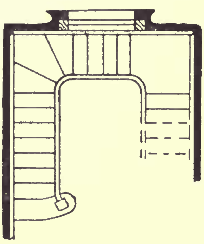
(220)—The spandril to stairs on ground floor to be in 1½ in. (or 1¾ in.) deal moulded and square framing, the upper panels being glazed with 21 oz. clear (or fluted) sheet glass in putty and loose beads. Form in framing a four-panel moulded and square door, hung on 4 in. butts in beaded frame, with chamfered stops, and fitted with lock and furniture, p.c. 10s. The upper panels of door to be glazed to match the adjoining panels, and in addition to be bedded in wash-leather. (Also see clause No. 231.)



Glass panels to doors should always be bedded in wash-leather and putty, on account of the jarring.

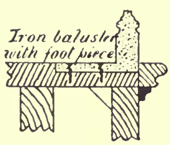
State if treads, risers, strings, landings, newels, balusters, handrails, soffits and spandrils, be in oak, teak, pitch pine, or other hard wood; and if French polished or varnished.

If the staircase have a continuous outer string and handrail, with a newel only at the start, then the outer string would be described as:—



2 in. (1¾ in. or 2¼ in.) solid wrought deal, rebated, sunk, moulded, beaded, cut and mitred continuous outer string, fitted with a flat iron bar (core) on the under side, and with wreaths glued up in thicknesses (and veneered if in hard woods), and fitted to newel and apron linings, and prepared for plastering.

The handrail to this form of staircase would be described as:—

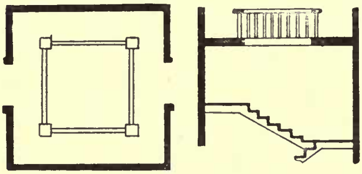


3 in. × 2½ in. moulded mahogany continuous handrail, with all wreaths, twists and handrail screws, ramped into newel, and fitted into wall at top. Care to be taken not to cripple the wreaths. The balusters and other parts would remain the same as in clause No. 218, but state there is to be a turned iron baluster with foot piece, screwed with countersunk screws to every seventh tread, and every 8 ft. apart on landings, and decorated to match the other work.

A continuous handrail may be strengthened with an iron core, as mentioned in the notes under clause No. 221. Staircases with very narrow "wells" require iron stiffeners to steady the handrail, if continuous; see Smith, clause No. 52; and notes to the following clause, No. 221.

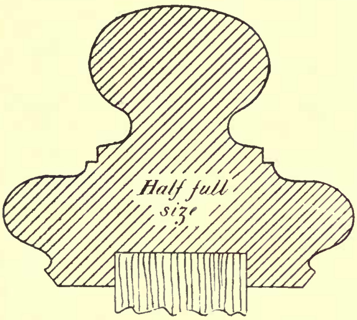
Gallery.

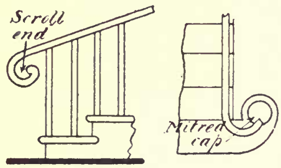
(221)—When a principal staircase does not go up to the top floor, sometimes a gallery is provided round on the top floor. Describe the apron linings, nosings, newels, balusters and handrail, as in clauses Nos. 218 or 220; and the joists and landings in a similar way as to floors.



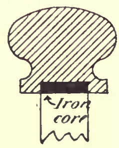
In a staircase with a "well," a skylight is both useful and ornamental, see clause No. 134a.

Handrails should be quite smooth for the hand to travel over, and any arrises should be below the touch of the fingers. A good section may be as sketch; this gives a comfortable handrail to catch hold of, with either plain or elaborate mouldings below. State if



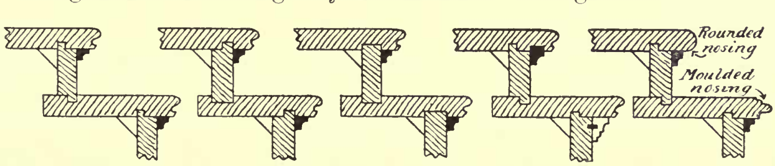


handrails are finished with a scroll end or with a mitred cap. If iron balusters be used, the handrail will require to be grooved, and an iron core $\frac{3}{16}$ in. thick by the width of the balusters, screwed on to the under side of the handrail, and to the top of the balusters. Handrail joints in best work may be mortised and tenoned together, as well as being fitted with handrail screws. If handrails are set out geometrically correct, they will sometimes look distorted: it is better to vary the height slightly in order to get a good line.



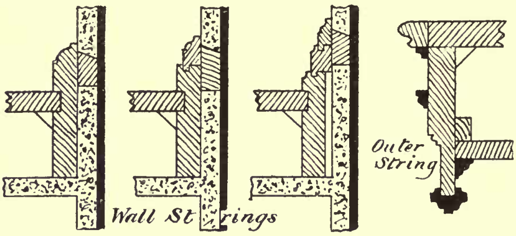
When space is an object, the balusters may be fixed outside the nosings of the treads and landings.

Treads and risers may be framed together, as sketches below; the moulding under the nosing may be housed in or tongued on.

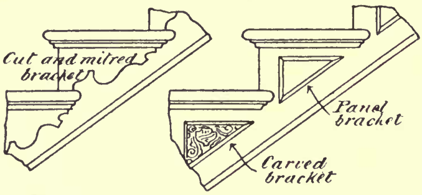


Nosings are usually rounded on the upper edge, but in hard woods they may be moulded.

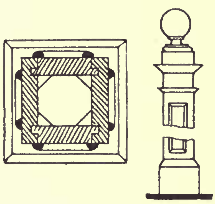
Wall strings may be in one, two or more pieces, with grounds and backings. Outer strings are generally moulded and sunk in the one piece, and may have, in addition, mouldings planted on along the face. A moulding may be described to the under side of strings in best work, whether the soffit lining be in plaster or wood.



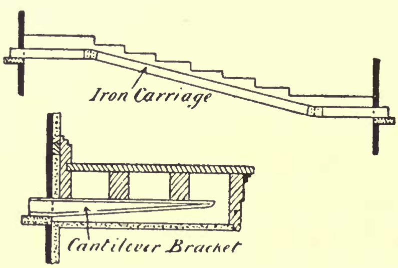
State if the spandril ends of steps have cut and ornamental brackets (about $\frac{1}{4}$ in. thick) mitred on, or if with panelled or carved brackets planted on.



Instead of newels being in the solid they may be framed up and glued and blocked together, with panels, carving, and mouldings; they may have an additional fixing to the floor with bolts, nuts heads and washers.



When stairs are very broad and of small rise, a great strain is put upon the wood carriages; it is better to carry the stairs with rolled iron or steel joist carriages, secured to the trimmers with angle plates, or built into the walls. Cast-iron cantilever brackets may also be required in some positions, being built in the wall and catching up the carriages. Hanging rods to the strings may also be required as supports. See Smith, clauses Nos. 35 and 12, for cantilevers and carriages respectively.



Staircases entirely in hard wood such as oak.

(222)—The description might remain the same as clauses Nos. 218 to 221, but state:—

The work to be secretly screwed together, glued and French polished.

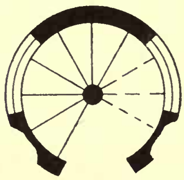
The wood soffits to be fixed to the strings and carriages with wood buttons.
The landings to be glued and tongued together.
The returned and mitred nosings to treads to be tongued on.

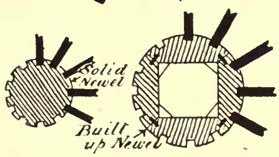
Iron carriages, brackets and hanging rods are especially useful in hard wood staircases, owing to their great weight; see notes to clause No. 221.

Circular staircase.

(223)—The treads, risers and wall strings may be described similar to a dog-legged staircase, see clause No. 217; but state the treads and risers are housed into a central deal newel 6 in. (to 9 in.) diameter, either in the solid or built up. Rough fir bearers are required instead of carriages for the soffit plastering. The handrail would be against the wall, and may either be in wood, as described to the wall handrail in clause No. 218; or in iron, see Smith, clause No. 50.

In circular staircases care must be taken that there is sufficient head room.

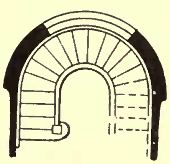




Staircase with semicircular turns.

(224)—This may be described similar to clause No. 218. The outer string and handrail would be continuous; see notes to clause No. 220.

There would be either one or two balusters to each of the winders.

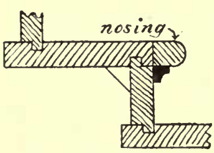


Serving stairs.

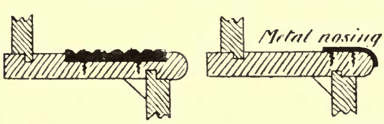
(225)—This may be a "dog-legged" staircase, as clause No. 217; or a "well" staircase, as clause No. 218, but simplified.

Renew nosings to old stairs.

(226)—Cut away the whole of the wood nosings to existing staircase, and renew in deal (or other wood) to match.

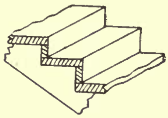


Where there is great traffic on a staircase there are various methods of protecting the wood stairs, such as with part metal stairs, either fixed on or let in flush as with some patent treads. Brass or iron



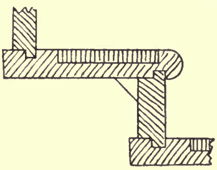
chequered nosings may also be used; or a plain strip of similar metals about $2\frac{1}{2}$ in. $\times$ $\frac{1}{4}$ in., which does not return round the nosing, may be employed. They should always be screwed on.

Temporary stairs.



(227)—Temporary stairs may be formed with rough cut wall and outer strings, with rough treads and risers spiked on.

Warehouse stairs.



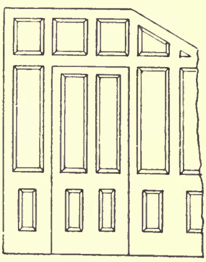
(228)—These should be made as simple as possible; the treads are generally in some hard wood, such as oak or teak. A very good plan is to form the staircase in the usual way, but with the treads $1\frac{3}{4}$ in. to 2 in. thick, rebated out some 6 in. to 8 in. in width by the whole length, and filled in flush with 1 in. boarding with the grain uppermost.

There are several patent kinds of wood stairs suitable for heavy traffic.

(229)—

(230)—

Spandril framing.

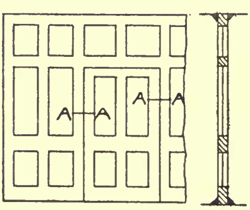


(231)—Also see clause No. 220.

Enclose staircase on ground floor with $1\frac{3}{4}$ in. ($1\frac{1}{2}$ in. or 2 in.) moulded and square spandril framing, three panels high, let into plastering on the one edge. Form in framing a four-panel, moulded and square door, hung on 4 in. wrought butts, and provided with a 6 in. brass mortise lock and brass furniture, p.c. 10s. Put $1\frac{1}{2}$ in. $\times$ $\frac{1}{2}$ in. door stop, and $2\frac{1}{4}$ in. moulded architrave on the one side.

The upper panels to have diminished styles and rails, rebated out for glass, and glazed with 21 oz. clear fluted sheet in putty with loose beads, the upper panels to door being glazed and bedded in wash leather and putty.

Panelled partition framing.



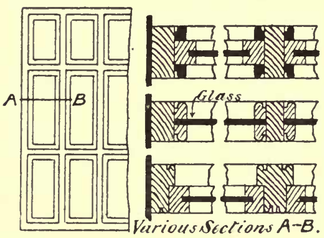
(232)—The partition across the servants' hall to be formed with $1\frac{3}{4}$ in. (or 2 in.) wrought deal square-panelled framing, three panels high, secured to floor and ceiling between $1\frac{1}{2}$ in. $\times$ 2 in. chamfered wrought deal fillets, and the wall edges being let into the plastering. Form in partition a four-panel door hung on 4 in. wrought butts, in rebated and beaded frame, and provided with brass mortise lock and brass furniture, p.c. 10s.

Various Details of Door at A—A

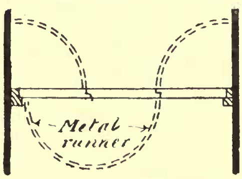
The rebate for the door may be formed with fillets, otherwise the door will have to be of a less thickness than the framing, unless it be rebated out.

State if panels are moulded, if there be a cornice as clause No. 210, or skirting as clause No. 197. State if upper panels have diminished styles and rails, and if glazed with 21 oz. fluted sheet, 21 oz. clear sheet, or $\frac{1}{8}$ in. close ribbed plate glass, fixed with loose beads in putty.

In very high partition framing, it may be necessary to form it with wrought deal 4 in. × 2 in. studs and horizontal pieces, 4 in. × 3 in. heads, sills, quarters and end posts. The panels may be formed with $1\frac{1}{2}$ in. square (or moulded) panelled framing (or $1\frac{1}{4}$ in. glazed panelled lights) secured between beaded fillets. Glass may be placed between the beaded fillets without separate framing. The timber framing may also be twice rebated and four times beaded, with the panelling filled in between.



Sliding partitions would be formed similar to sliding doors, see clause No. 250. Partitions folding back would be similar to folding doors, see clause No. 249, and provided with $2\frac{1}{2}$ in. × $\frac{1}{4}$ in. brass or iron runners fixed to floor with countersunk screws, upon which would run small wheels fixed to each leaf of the partition.

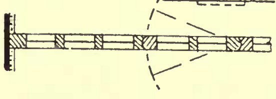


Dwarf partitions.

(233)—The dwarf partition across office to be formed in wrought framed Honduras mahogany (oak, deal or other wood), and French polished, with:—

2 in. (or $1\frac{3}{4}$ in.) moulded both sides, two-panels high framing, tongued on to capping, with end styles let into plaster.

Form in framing a 2 in. (or $1\frac{3}{4}$ in.) four-panel, moulded both sides door, tongued for capping, with rounded styles working in a hollow groove in framing, and hung on patent brass-cased steel spring hinges, p.c. 20s., and provided with two brass handles, p.c. 12s. each (or two 10 in. × 3 in. × $\frac{1}{8}$ in. brass finger plates), one 6 in. brass barrel bolt, and two brass spring door stops.



3 in. (or $3\frac{1}{2}$ in.) × 2 in. moulded grooved capping.

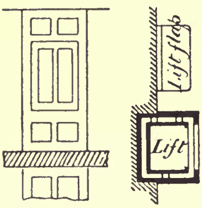
The framing to be secured to floor, and stiffened every 4 ft. apart with $1\frac{1}{2}$ in. × $\frac{3}{8}$ in. wrought-iron (or brass) angle brackets, having 18 in. arms sunk in flush, and screwed with countersunk screws every 3 in. apart.

State if top panels to framing and door have diminished styles and rails, and if glazed with 21 oz. fluted sheet (leaded or other) glass in putty, with loose beads and brass cups and screws.

If the door is to swing only one way, it may be hung on 3 in. brass or wrought-iron butts against a small fillet stop, or the styles of door and framing may be rebated together.

If there be an angle to the framing, it should be grooved and rebated together, and finished with a double quirked bead.

Dinner lift framing and lift.



(234)—Describe as $1\frac{1}{2}$ in. (or $1\frac{3}{4}$ in.) square (or moulded) panelled framing, staff beaded at angles, with doors hung folding in beaded frame against fillets on $2\frac{1}{2}$ in. brass butts, and furnished with brass spring catches (or bolts), and $1\frac{1}{4}$ in. diameter brass rose handles.

Board round the inside of lift "well" where against brickwork with $\frac{3}{4}$ in. (or 1 in.) deal matched and beaded boarding on backings.

Lift. Allow the p.c. sum of (say) £10 for lift.

The cost of a lift will vary according to the height it has to travel, in addition to its size. "Single" dinner lifts may be had in the following and other sizes:—

Load to be Raised.	Width Inside Cage.	Depth Inside Cage.	Height Inside Cage.	Clear Size of "Well" for Working.
lbs.	ft. in.	ft. in.	ft. in.	ft. in. ft. in.
30	1 4	1 4	2 0	1 10 × 1 9
56	2 1	1 6	2 6	2 8 × 1 11
84	2 2	1 6	2 9	2 9 × 1 11
112	2 3	1 9	2 9	2 10 × 2 3

Allow sufficient space above the lift for the gear.

The bottom of cage should rise 2 ft. 9 in. above the floor level.

The lift should be fitted with one or two movable shelves.

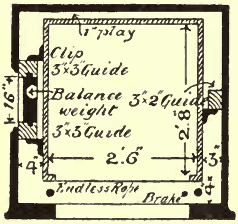
A very useful size for a dinner lift to a fairly large house is one which will raise a 56 lb. load. In small houses, one to raise a 30 lb. load will be sufficient.

"Double" dinner lifts are more suitable for hotels and restaurants.

Lift flaps. If for a dinner lift, then see clause No. 305.

Hand power box (or luggage) lift.

These lifts are made in proportionate sizes to raise loads of $1\frac{1}{2}$, 2, 3, 4, 5, 6, 8 and 10 cwts. A box lift suitable for raising the ordinary luggage of a private house will be sufficient if it raise $1\frac{1}{2}$ cwt. to 2 cwts. The largest trunk in use is not more than about 3 ft. × 2 ft. × 2 ft. 6 in., therefore a box lift large enough to take a trunk of this size with the trunk standing on end would require the cage to be 2 ft. 8 in. × 2 ft. 6 in. × 4 ft. 6 in. inside sizes, or over all 2 ft. 10 in. × 2 ft. 8 in. × 4 ft. 7 in. The sketch will show the least size required for a "well" to this sized lift. If space be so limited that there is not room for the three guides, then the two guides only may be fixed on the one side, allowing only 1 in. play on the opposite side; but, of course, three guides are preferable for easy and quiet working.



If the lift be outside in the open, then the guides should be in wrought iron, and an iron hood placed over the gear at the top for protection from the weather.

In the lift framing enclosing a luggage or coal lift, describe a sill-piece to the door openings in 4 in. × $2\frac{1}{2}$ in. oak, rounded on edge and placed 2 ft. 6 in. up.

When the luggage lift is outside, ordinary doors may be placed in the opening in the walls for access to the lift. These openings must be protected up to about 2 ft. 6 in. from the floor levels with a strong iron railing with oak capping piece on top.

When a lift travels up the "well" of a staircase, it may be necessary to put a protection to the sides of the "well" round the guides, formed of wire netting.

The framing to a passenger lift may be very elaborate and be partly glazed, with doors of the ordinary size for access.

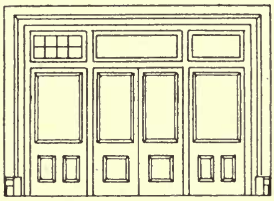
There are many other forms of lifts for various purposes.

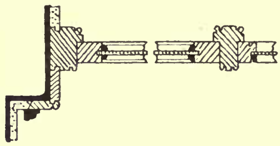
Lifts may be worked by hydraulic pressure obtained either from a street main, or from a tank placed above the lift in the roof of a building. Special mains are laid in London and some of the other large cities for the purpose of providing a high-pressure service for hydraulic lifts up to about 700 lbs. per square in., and occasionally as much as 1000 lbs. per square in. All heavy weights are generally raised by hydraulic pressure. When a lift is worked with a ram, suitable provision must be made in the ground for its reception.

Vestibule framing.

(235)—The vestibule framing to be formed with:—

$4\frac{1}{2}$ in. × 3 in., four times moulded (or four times beaded) and twice rebated deal posts and transome, the heads and posts against walls being twice moulded (or twice beaded), once rebated and twice grooved for linings (or plaster). Tongue on to transome an $1\frac{1}{2}$ in. × $1\frac{1}{4}$ in. moulding on both sides. Put 1 in. wrought, twice





rebated linings, 1 in. beaded grooved and splayed grounds, and 3 in. × 2 in. moulded architraves. Fill in side lights with 2 in., moulded both sides (or bolection moulded, or raised bolection moulded), panelled framing, with diminished rails and styles, and upper panels prepared for glass with loose beads, and glaze with $\frac{1}{4}$ in. polished British plate glass in wash leather and putty. Hang folding, similar glazed door framings, with rebated and beaded meeting styles, on 5 in. wrought-iron (or brass) butts, and provide with mortise lock and furniture, p.c. 10s., two brass bolts 18 in. long, and two brass spring door stops.

Fill in fanlights with 2 in. moulded framings (state if in small squares), glazed to match doors.

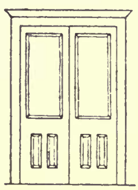
The glazing may be in lead lights, see Glazier, clause No. 10. State if framing is in Spanish mahogany, oak, or other hard wood, and describe the polishing. Vestibule framing may be formed with pilasters, arches, caps and bases, similar to wall panelling, see notes to clause No. 206. The framing might also be similar to partition framing, see clauses Nos. 232 and 233.

Cloak rails.

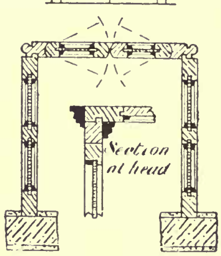
Put on two sides of vestibule lobby a 6 in. × $1\frac{1}{4}$ in. (or $1\frac{1}{2}$ in.) wrought, moulded (or beaded) all round, French polished mahogany cloak rail, on narrow double splayed deal grounds, and provided with brass (or japanned malleable cast iron) hat and coat hooks every 9 in. (or 12 in.) apart.

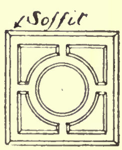
Internal lobby framing.

(236)—The lobby framing to be French polished, and formed in wrought framed Honduras mahogany (oak, deal or other wood) with :—



2 in. (or $2\frac{1}{4}$ in.) moulded both sides two (or more) panel high framing, rebated and grooved together, with wall edges let into plaster, staff beaded at angles, and finished with a 3 in. × 2 in. moulded capping.





Hang folding, 2 in. (or $2\frac{1}{4}$ in.) moulded both sides, three-panel doors, with diminished and rounded styles and diminished top rail, and upper panels prepared for glass, with loose beads, brass cups and screws, and glazed with $\frac{1}{4}$ in. best British polished plate glass in wash leather and putty. The doors to swing in a hollow groove in the framing, on patent brass-cased, steel spring hinges, p.c. 30s. a pair, and be provided with four brass handles, p.c. 12s. each, two 12 in. and two 18 in. brass barrel (tower or flush) bolts, and two brass spring door stops, p.c. 4s. each.

The soffit to be 2 in. (or $2\frac{1}{4}$ in.) five-panel, moulded and square framing, flush on top, grooved all round, and finished with a $2\frac{1}{2}$ in. × $1\frac{1}{2}$ in. moulded cornice on the inside.

State if panels are bolection moulded. Instead of handles, brass finger or door plates about 10 in. × 3 in. × $\frac{1}{8}$ in. metal may be supplied.

Doors and Gates.

(Clauses Nos. 237 to 277.)

For open carriage and field gates, see clauses Nos. 330 and 331 respectively.

Generally to all doors.

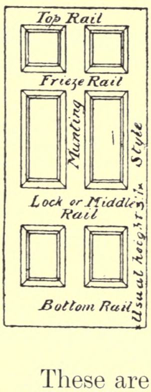
(237)—All doors to be knocked together and stacked in the dry three (or six) months before glueing up, and when hung to be sufficiently short of the flooring to clear the carpets. (See clause No. 139, referring to the painting of window frames, which may be modified to doors and inserted here.)

Solid frames.

Solid door frames to have horns 3 in. (to 6 in.) wide left on the heads. (For shoes see clause No. 38, which may perhaps be inserted here, as also portions of clause No. 10.)

See clauses Nos. 10 and 38 for sketches of horns and shoes respectively.

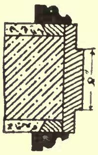
Panels.



Panelled doors up to 3 ft. wide to have 9 in. lock and bottom rails, $4\frac{1}{2}$ in. top (and frieze) rails, styles and muntings. Panelled doors over 3 ft. wide to have 11 in. lock and bottom rails, $5\frac{1}{2}$ in. top (and frieze) rails, styles and muntings. The panels to doors in principal rooms, and all panels over 11 in. wide, to be in pine, none being less than $\frac{3}{4}$ in. thick, and housed or rebated into grooves in the framing. (The usual height to the top of the lock rail is 3 ft. 1 in.)

These are the general sizes of framings to doors. There is no frieze rail to a four-panel door. When panelled doors are very thick, the panels are sometimes formed with two separate thicknesses having a space between, but this is governed mainly by the depths of the mouldings in the panels.

Generally to linings.



(238)—Jamb and head linings to be panelled when the width of the lining clear of the rebates exceeds 8 in. The panels to linings of principal rooms, and all panels over 11 in. wide, to be in pine, none being less than $\frac{3}{4}$ in. thick, and housed or rebated into grooves in the framing.

Thus, linings to walls up to one brick thick would not require panels.

Four-panel doors are usually made 2 ft. 10 in. wide by 6 ft. 10 in. high.
" " " 3 ft. 0 in. " 7 ft. 0 in. "
" " " 3 ft. 6 in. " 7 ft. 6 in. "

Doors over 3 ft. 6 in. wide may be hung in two halves, or else made to slide. When a large opening is required, sliding doors are best, as hung doors, when open, take up too much room space. Sliding doors may be made any width from 5 ft. to 12 ft.; a very fair width of opening is 8 ft.

It will make a specification more clear to describe, first, any specially framed doors to each separate floor; and then to describe all the remaining doors on each separate floor in the one description. The ironmongery should be taken to each door as it is mentioned. It is better to put a p.c. amount to each door for the door furniture and locks.

Doors are divided into two classes, "ledged" and "panelled"; ledged doors being used more especially for outside offices, stables, farm buildings and small gates; and panelled doors for internal work, entrance doors and main entrance gates.

Here are a few of the names of different kinds of mouldings as applied to panelled work, which may be varied in many ways:—

Square-framed, plain panels.

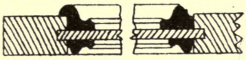
Square-framed, plain panels one side, and bead butt (or bead flush) other side.

Square-framed, plain panels one side, and moulded other side.

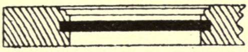
Square-framed, moulded panels both sides.

Square-framed, plain panels one side, and bolection moulded other side, rebated on.

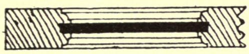
Bolection mouldings are usually rebated on to the door framing, but at the same time the effect is not so pleasing as when they are placed within the lines of the framing, as by the former method the lines of the mouldings throw out the lines of the framing.



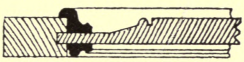
Square-framed, moulded panels one side, and bolection moulded other side (rebated on).



Square-framed, plain panels one side, and solid moulded other side.



Square-framed, solid moulded panels both sides.



Square-framed, moulded and flat panels one side, bolection moulded and raised splayed panels other side, with an inner bead (or moulding) worked (or planted) on the panel.

Locks and furniture.

(239)—In a p.c. amount referring to a lock and furniture, the contractor is to allow in his estimate as for fixing a mortise lock, two handles, two escutcheons, with eye plates, and two short and two long finger plates to each door.

Finger plates.

(240)—Allow the p.c. sum of (say) £10 for finger plates, to be fixed where directed.

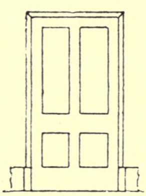
A lock and furniture is usually taken as referring to the lock (either rim or mortise), the two handles and the two escutcheons with eye plates; but by putting a p.c. amount it saves much description, and the class of article can be selected afterwards, either in brass, iron, china, wood, glass or other material.

PANELLED DOORS.

(Clauses Nos. 241 to 262.)

Internal basement and kitchen office doors.

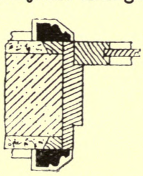
(241)—Each of the (say) seven doors to be 2 in. ($1\frac{3}{4}$ in. or $1\frac{1}{2}$ in.) wrought deal, square-framed, four-panel framing, hung on one pair of 4 in. wrought-iron butts, and provided with a 6 in. (or 7 in.) rim (or mortise) lock and furniture, p.c. 6s. (to 10s.),



with

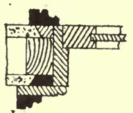
Plain jamb linings.

$1\frac{1}{4}$ in. (or $1\frac{1}{2}$ in.) wrought deal, twice rebated jamb and head linings, tongued at angles and fixed on backings, with 3 in. × $1\frac{1}{2}$ in. moulded architraves planted on both sides of linings, mitred at angles, and with narrow splayed grounds and plinth stops.

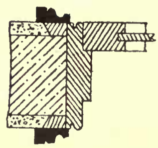


Plinth stops are seldom put in servants' offices.

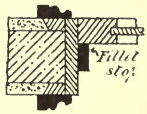
In very thin walls or partitions the linings are sometimes only once rebated. In any case, the linings may be twice beaded (or twice moulded) if desired.



Linings to Stud Partition

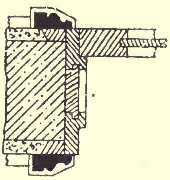


The rebates to the jamb linings may be formed by planting on a fillet stop.



In walls over one brick thick the linings may be panelled, when the description would run as:—

Panelled jamb linings.



$1\frac{1}{4}$ in. (or $1\frac{1}{2}$ in.) wrought deal, square-framed, two-panel high jambs and one-panel head, twice rebated linings, tongued at angles, and fixed to dovetailed backings, with 3 in. × 2 in. moulded architraves planted on both sides of linings, mitred at angles, and with narrow splayed grounds and plinth stops.

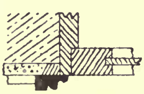
The linings may be twice beaded (or twice moulded) if desired.

This class of door and lining is suitable for all servants' offices, bedrooms, and any ordinary plain work. See notes under clause No. 244, referring to the panelling of jamb linings.

Wrought and cast-iron butts are made from 2 in., $2\frac{1}{2}$ in., 3 in., $3\frac{1}{2}$ in., 4 in., 5 in. to 6 in. long. Cast-iron butts are used in inferior work. Broad butts are made $2\frac{1}{2}$ in. × 3 in., 3 in. × 3 in., 3 in. × $3\frac{1}{2}$ in., $3\frac{1}{2}$ in. × $3\frac{1}{2}$ in., 4 in. × 4 in., 4 in. × $4\frac{1}{2}$ in., and used in positions where the thickness of material is insufficient to get a firm fixing for the screws.

The lower panels of any doors in dark situations may be glazed with $\frac{3}{8}$ in. rough plate (or other) glass. This will give some light as a guide for the feet.

Internal cellar doors and linings.

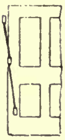


(**242**)—Describe similar to kitchen doors and linings, as clause No. 241; but the architraves are sometimes placed only on the passage side.

Internal servants' W.C. doors and

(**243**)—Describe similar to kitchen doors and linings, as clause No. 241, and state that each door is to be hung on one pair 4 in. wrought-iron butts, and provided with a 6 in. brass (or iron) barrel bolt, a rim (or mortise) lock and furniture, p.c. 6s., and one 4 ft. steel rod spring, p.c. 2s.

Brass or iron handles may be supplied to w.c. doors in lieu of a lock. Springs to w.c. doors are useful in keeping them closed; they may be had with brass casings for better class work. Steel rod door springs are made 3 ft., 3 ft. 6 in., 4 ft., 4 ft. 6 in., 5 ft. and 5 ft. 6 in. long, these are fixed vertically to the hanging style and the door frame, see sketch. Brass door springs are made in various shapes, and of a p.c. value from about 3s. to 6s.

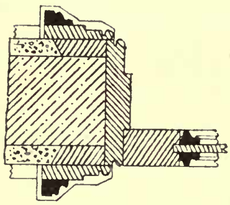


Internal ground floor and similar doors.

(244)—Each of the (say) ten doors to be 2 in. ($1\frac{3}{4}$ in. or $2\frac{1}{4}$ in.) wrought deal, square-framed, four-panel, moulded both sides framing, hung on one pair 4 in. brass (or iron) butts, and provided with mortise lock and furniture, p.c. 10s.

with

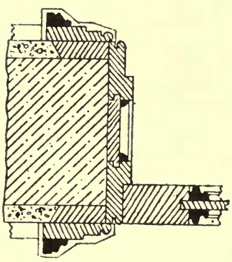
Plain jamb linings.



$1\frac{1}{4}$ in. (or $1\frac{1}{2}$ in.) wrought deal, twice rebated and twice beaded (or twice moulded) jamb and head linings, tongued at angles, and fixed on backings, with $4\frac{1}{2}$ in. $\times$ $\frac{3}{4}$ in. (or 1 in.) wrought, sunk and beaded (or moulded) framed grounds on splayed backings, and 3 in. $\times$ 2 in. moulded architraves placed on both sides of linings, mitred at angles, and with plinth stops.

or,

Panelled jamb linings.



$1\frac{1}{4}$ in. (or $1\frac{1}{2}$ in.) wrought deal, twice rebated and twice beaded (or twice moulded) square-framed, moulded two-panel high jambs, and one-panel head lining, tongued at angles, and fixed to dovetailed skeleton framed backings, with $4\frac{1}{2}$ in. $\times$ $\frac{3}{4}$ in. (or 1 in.) wrought, sunk and beaded (or moulded) framed grounds on splayed backings, and 3 in. $\times$ 2 in. moulded architraves planted on both sides of linings, mitred at angles, and with plinth stops.

Ordinary four-panel doors are made $1\frac{1}{2}$ in., $1\frac{3}{4}$ in., 2 in., $2\frac{1}{4}$ in. and $2\frac{1}{2}$ in. thick, according to their position and size: $1\frac{3}{4}$ in. being the least desirable thickness for fairly good class work.

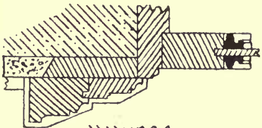
State if the doors have more or less than four panels, and in that case, the jamb linings if panelled should correspond in the heights of the panels to those of the doors. State if the doors have irregular panels, and if segmental (semicircular or elliptical) headed, and whether the head linings are to be square or to follow the sweep of the door heads. State if the doors are to a circular sweep on plan.

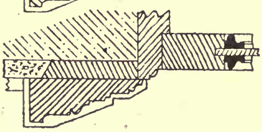
Moulded doors may be moulded on one side only; moulded on both sides; or moulded one side and bolection moulded the other side; or bolection moulded both sides. If bolection moulded, state whether the mouldings be rebated on to the framing.

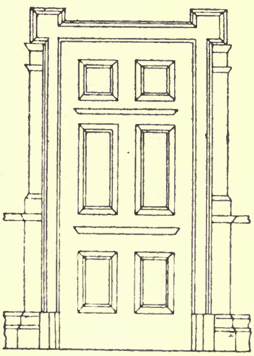
State if the doors are to have moulded raised panels on one or both sides, with an inner bead or moulding either worked or planted on the panels; or whether with moulded splayed raised panels on one or both sides, with inner bead or moulding worked or planted on the panels.

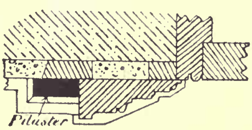
Jamb linings can only be moulded on the one side, and the panelling, together with the rails, should correspond with the heights of the door panels, but the styles may be less in width than the door styles.

Architraves may be very elaborate, and of some considerable width, and may be built up either in sections or formed out of the solid; state clearly which way. Pilasters may be required on each side of the architraves, these may be specified as $\frac{3}{4}$ in. (1 in. or $1\frac{1}{4}$ in.) thick on splayed grounds, with cap, necking, base, dado and skirting mouldings planted on. The architrave should project sufficiently to allow these mouldings to butt up against it, without their projecting beyond it. The lock and frieze rails may have mouldings planted on; state if dentils or carved mouldings are required.





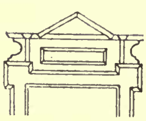




Doors are also hung with brass butts and screws, either with or without steel (or gun-metal) washers (joints); or on brass rising butts with double steel (or gun-metal) joints. Brass and iron butts can be obtained in $1\frac{1}{2}$ in., 2 in., $2\frac{1}{2}$ in., 3 in., $3\frac{1}{2}$ in., 4 in., $4\frac{1}{2}$ in. and 5 in. sizes. When a door is hung on rising butts, state that the top rail of door is to be splayed off. When a door is very heavy, either owing to its size or its being made of a hard wood, it requires to be hung with $1\frac{1}{2}$ pairs of butts, but only one pair of rising butts should be fixed to one door. Hard wood doors require very strong butts. Brass butts for high class work should be described as polished. Butts with steel washers are not suitable for outside work, the washers should then be in gun-metal. Projecting butts allow a door to open well back.

State if internal doors are to be provided with india-rubber door stops.

Overdoors.



(245)—These may be varied in design, and either plain or elaborate. A p.c. sum may be allowed, or else they may be described in detail. State whether in hard wood, and if French or wax polished, and give a sketch in the margin.

Best W.C. doors and linings.

(**246**)—Describe similar to ground floor doors and linings, see clause No. 244, but in addition state they are to be provided with a 6 in. brass barrel bolt, a brass-cased steel spring, p.e. 3s. 6d., a patent indicator tablet showing "engaged" and "vacant," p.c. 6s. (this may be either in nickel or brass), and a brass coat hook.

First floor doors and linings.

(**247**)—Describe similar to ground floor doors and linings. See clauses Nos. 244 and 246.

A glazed fanlight may be fixed over any doors, either to give ventilation or light from or to a passage; see Glazier, clause No. 9, with sketch.

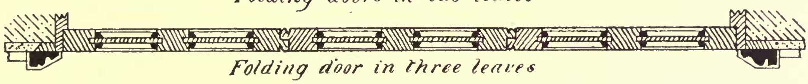
Top floor doors and linings.

(**248**)—May be similar to basement doors and linings. See clauses Nos. 241 and 243.

Folding doors and linings.

(**249**)—Describe each door in a similar way to clause No. 244, but state that the doors are to be hung folding,

Folding doors in two leaves

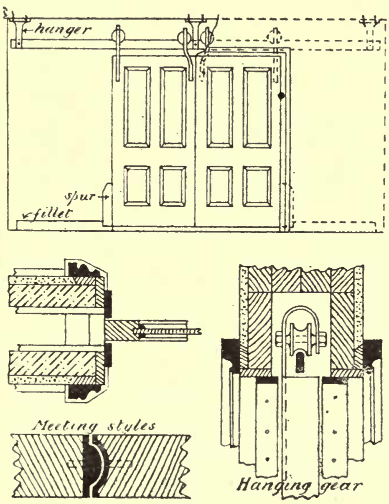


Folding door in three leaves

with rebated and beaded meeting styles, and provided with two 12 in. (or 18 in.) brass barrel (or flush) bolts (in addition to the other furniture). If the door opening be wide, perhaps three or more leaves (doors) may be required, then describe in a similar way as clause No. 244; but mention the number of leaves, the rebated and beaded styles, the bolts, and the back flap (or other) hinges to the centre leaves (in addition to the ordinary furniture).

Internal sliding doors hung at top.

(**250**)—The sliding doors between reception rooms to be 2 in. ($1\frac{3}{4}$ in., $2\frac{1}{4}$ in. or $2\frac{1}{2}$ in.) wrought deal, square-framed, four-panel, moulded both sides framings, with oak spurs 2 ft. high, 4 in. broad, and 1 in. wider than the thickness of the doors, screwed on to the outer styles, and running between fillets 2 in. deep placed in the wall space as guides. Each door to be hung from the top on two 4 in. diameter cast turned gun-metal (or iron) bushed wheels, fixed with bolts, heads and nuts to $2\frac{1}{4}$ in. × $\frac{1}{4}$ in. wrought-iron straps screwed to the door styles 15 in. down with countersunk screws every 3 in. apart. The hanging bar to be $3\frac{1}{2}$ in. × $\frac{1}{2}$ in.



wrought iron, planed "round" (or double bevelled) on the top edge, and supported by three cast (or wrought) iron hangers screwed to the lintel. The meeting styles to be provided with a brass (or gun-metal) hollow rebated and tongued joint screwed on, having two brass pull flush ring handles in it. Put four brass flush handles p.c. 3s. 6d. per pair flush with the styles.

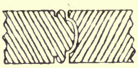
Then describe the linings and architraves as clause No. 244; but state that the linings are to be made movable, and fixed with brass cups and screws for access to gearing.

Sliding doors may run with wheels along a metal runner screwed to

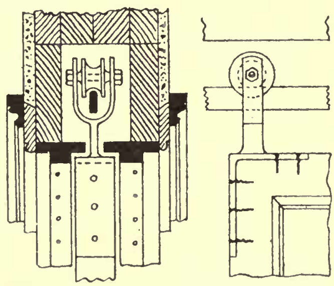
the floor, but they do not work smoothly, as the top rails have to run between a groove as a guide, and consequently there is much friction. The metal rail also, when standing above the floor, is apt to trip one up, and if placed flush with the floor the grooves get filled up with dirt.

Flush bolts may be provided to the door, as also a "hook" lock; but in sliding doors opening up two rooms, neither bolts nor locks are absolutely necessary.

If the doors be fairly thick, as 2 in. ($2\frac{1}{4}$ in. or $2\frac{1}{2}$ in.), then the joint in



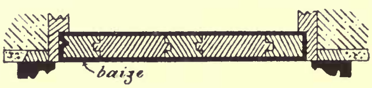
the meeting styles may be formed in the framing instead of there being a metal joint.

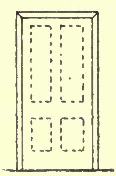


By forming the hangers as sketch, a very small gap shows in the head linings when the doors are open.

Patent roller wheels may be employed for doors sliding either at the top or bottom, see clause No. 269.

Baize doors.

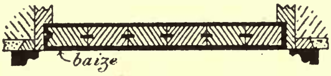


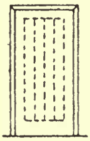


(251)—The door to study (or private office) to be $1\frac{3}{4}$ in. ($1\frac{1}{2}$ in. or 2 in.) wrought solid deal, four-panel, square-framed panelling, with $1\frac{3}{4}$ in. ($1\frac{1}{2}$ in. or 2 in.) wrought solid deal, flush both sides panels, covered over on both sides and edges with strong superfine green (red or blue) baize on a backing of thick brown paper, with a groove and slip joint on hanging style, and copper tacked on top and bottom rails. Form imitation panels on both sides, with brass-headed nails every 1 in. apart (or with brass beads).

If the door be very large it may have six or more panels.

The imitation panels formed with the brass nails or brass beads are not often desired. Baize doors may be fixed in addition to an ordinary door in any position to exclude sound. They are sometimes used in w.c.'s. When the panels are only flush one side the baize is only put on the one side.

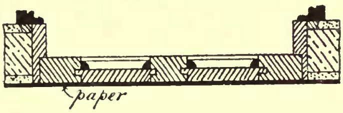




A cheaper class of baize door may be formed with a skeleton frame, filled in with solid, tongued and grooved boarding, and then covered with baize.

Jib door.

(252)—This class of door is used when it is not desired to show as a door in the room. It is formed with flush panels one side similar to a baize door, see clause No. 251; and may either be square or moulded the other side. State it is to be papered over on the flush side to match the walls of the room, with the dado, skirting or other mouldings planted on to carry round the lines of the other work. The architrave and linings would only show on the one side.



Doors and linings in oak or other ornamental hard woods.

(253)—The description would be the same as to ground floor doors, see clause No. 244; but owing to the weight of hard wood doors, deep and strong hinges must be used, say 5 in. or 6 in. deep. It is better to hang hard wood doors on a pair and a half of butts—that is three butts to each door; see notes under clauses Nos. 241 and 244 referring to hinges. State whether door and linings are French or wax polished.

See notes under clause No. 255, referring to solid frames for heavy internal doors.

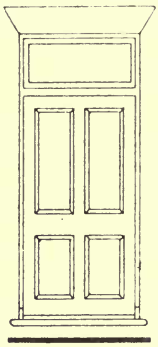
Veneered doors and linings.

(254)—The dining-room doors to be veneered on the one (or both) side and edges in wainscot oak (mahogany, walnut, or other fancy wood), with solid wainscot (or other fancy wood), mouldings round the panels, the whole being French (or wax) polished.

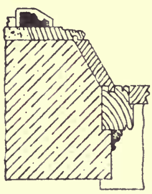
State if the linings are to be veneered to match, with solid fancy wood mouldings in the panels; and whether the architraves also are to be in the solid fancy wood.

It is always best to veneer on a "hard" wood such as mahogany. If deal be veneered upon it should not be less than 2 in. thick, and perfectly seasoned and dry, otherwise the veneer will split. The actual description of the door and linings would be similar to other ordinary doors, as clause No. 244; but if an old door be veneered upon, then it must be "planed up square level and smooth."

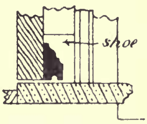
External entrance door.

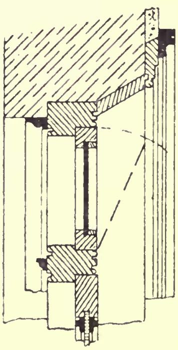


(255)—To be 2 in. ($1\frac{3}{4}$ in., $2\frac{1}{4}$ in. or $2\frac{1}{2}$ in.) wrought deal, square-framed, four-panel (more or less), moulded both sides framing, the lower horizontal mouldings to panels on the outer side being weathered off. Screw on to bottom rail a 3 in. × 2 in. deal moulded and throated weather stop. Provide door with a brass mortise lock and furniture, p.c. 12s.; one brass night latch and two keys, p.c. 8s.; two 12 in. (or other size) brass (or bright iron) barrel bolts; one 9 in. brass (or japanned iron) door guard and chain, p.c. 2s. 6d.; one brass cased steel door stop catch, p.c. 3s. (state if a brass and india-rubber buffer be required instead of the door catch, and allow a p.c. sum); one brass knocker and plate screwed through door with nuts and washers, p.c. 12s.; one brass (or iron) door knob bolted through door with nut and washer, p.c. 5s.; and a brass letter plate, p.c. 12s., with perforation in door, and screwed on (or bolted through door with nuts and washers).



Hang door on $1\frac{1}{2}$ pairs 5 in. wrought-iron (or brass) butts to a $4\frac{1}{2}$ in. × 3 in. solid wrought deal, rebated and twice beaded (or twice moulded) frame, grooved all round for linings, and with cast-iron shoes let into threshold. The transome to be $4\frac{1}{2}$ in. × 3 in. twice rebated and four times beaded (or four times moulded), with a small moulding tongued on the outer side. Put 1 in. (or $1\frac{1}{4}$ in.) wrought deal, twice rebated, splayed (or square) jamb and head linings, tongued at angles and fixed to backings; with $\frac{3}{4}$ in. (or 1 in.) × $4\frac{1}{2}$ in. wrought deal, sunk, grooved, beaded (or moulded), framed and splayed grounds; and 3 in. × 2 in. moulded architraves mitred at angles, with narrow splayed grounds and plinth stops. Run round the outside of frame a 2 in. × $1\frac{1}{4}$ in. deal (or oak) guard moulding.

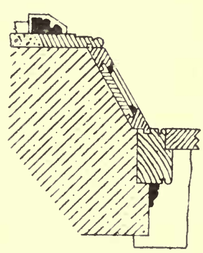


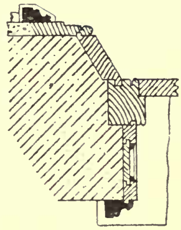


Fill in fanlight opening with a 2 in. ($1\frac{3}{4}$ in. or $2\frac{1}{4}$ in.) moulded deal sash having movable beads and brass cups and screws, and glazed in putty with $\frac{1}{4}$ in. British polished plate (or other) glass. Hang fanlight on one pair of 3 in. wrought-iron (or brass) butts to open inwards, and provide with two brass quadrant stays and a small brass spring fanlight catch.

For mat space see clause No. 64; and Pavior, clause No. 2.
For front door bell see Bell Hanger, clauses Nos. 6, 9 or 10.

If the wall be thick the jamb linings may be panelled similar to internal door linings, as in clauses Nos. 241 or 244.





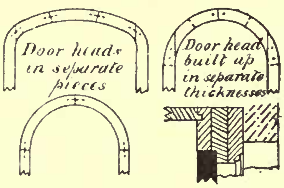
If external linings and architraves be required, they would be described similar to the internal architraves and linings either as plain or panelled, a groove being formed on the outer side of frame to receive them.

If fanlights are to open with any special gear, state the kind and the name of the manufacturer, and give a p.c. sum. Or they may open with hemp lines, brass (or iron) cleats and pulleys.

Solid door frames are usually 4 in. × 3 in., $4\frac{1}{2}$ in. × 3 in., 4 in. × 4 in., $4\frac{1}{2}$ in. × 4 in., $4\frac{1}{2}$ in. × $4\frac{1}{2}$ in., 5 in. × 4 in., 5 in. × $4\frac{1}{2}$ in. and 6 in. × $4\frac{1}{2}$ in.

A "proper door frame" signifies a "wrought, rebated and twice beaded frame" only; but the term is now almost obsolete. The distinct labours should be accurately mentioned.

State if the door head be segmental; and if it be of very small rise it can be cut out of the solid. The fanlight also should be described as segmental headed to match. If the door head be to a quick segmental rise, or semicircular, or elliptical, then, and in each case, state it is to be put together in two (or three) separate pieces, connected together with oak keys and wedges (or with handrail screws). Door heads to circular sweeps may also be formed in two or three separate thicknesses, secured together with oak pins. State if the head linings be square, or if they are to follow the sweep of the door head.

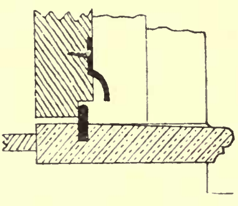


Mention if door panels be bolection moulded either on one or both sides, and if the moulding be rebated on to the framing.

The bolts may be either barrel, tower or flush, and are made of almost any length; the upper bolt is generally required to be the longer, so that it may be within reach. Bolts are generally made from 9 in. to 30 in. long. Door chains are made 4 in., 6 in., 8 in. and 10 in. long. A spring door catch will secure the door when open, or a cabin hook and eye may be used instead. Cabin hooks are made up to about 18 in. long.

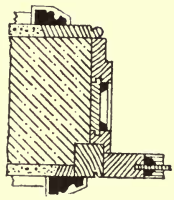
The guard moulding is not always put round the door frame, it being merely ornamental.

An $1\frac{1}{2}$ in. × $\frac{3}{8}$ in. wrought-iron bar may be grooved into the stone threshold for the door to shut against, the bottom rail being rebated out to receive it. It assists in keeping out the wet, but must not be allowed to stand up too high, otherwise people will trip over it. In lieu of the deal weather stop, a $\frac{1}{4}$ in. (or $\frac{3}{8}$ in.) cast brass (iron or gun-metal) shaped weather stop may be screwed on to the bottom rail of the door with countersunk brass screws every 9 in. apart.

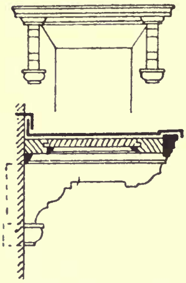


Knockers and letter plates are also made in iron and gun-metal, and vary in price from 3s. to £1. 10s.

Solid frames are usually required for outside doors only, but if an internal door be extraordinarily heavy, or if from any other cause a solid frame be required internally, then the sketch will show how this may be placed.

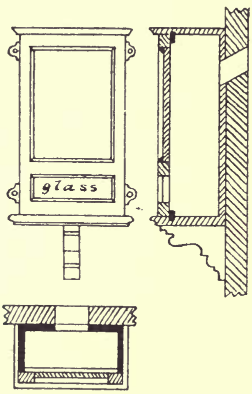


External entrance doors may be provided with an overhanging door head or canopy, formed either with plain or moulded panelled framing, but flush on the upper side, with a moulding round the eaves as a finish. The brackets would be cut, shaped and moulded, and supported on moulded stone corbels, all of which should be well tailed into the wall. The head should be covered with 6 lb. lead, copper nailed at the edges, and with 5 lb. lead flashing against the wall.



Letter box.

To be ½ in. dovetailed and beaded oak (or ¾ in. deal) box, 12 in. (to 24 in.) × 8 in. (to 12 in.) × 6 in. (to 8 in.) in the clear, with ¾ in. oak (or 1 in. deal) one (or two) panel door hung on one pair of 2 in. brass butts, and supplied with a brass lock and two keys, and glazed (or partly glazed) with 21 oz. sheet glass, and supported on one (or two) small cut 1¼ in. oak (or 1½ in. deal) bracket secured to door with small brass plates.



or,

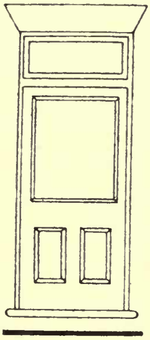
The letter box may be in galvanised iron wire work, p.c. 8s.

The top and bottom of letter box may or may not project slightly beyond the front and sides, and may either be rounded or moulded on edge. The top is sometimes made to slant.

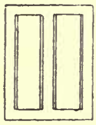
Double-margined external door.

(**256**)—The description would remain the same as in clause No. 255, except that it should be described as a "double-margined door," with a bead worked on both sides of munting; the munting being twice the width of the outer styles and in one piece.

Entrance door partly glazed.



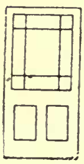
Shutter.



(257)—To be 2 in. ($1\frac{3}{4}$ in., $2\frac{1}{4}$ in. or $2\frac{1}{2}$ in.) wrought deal, square-framed, three-panel (more or less), moulded both sides framing, with moulded diminished styles and top rail, and loose inner beads fixed with brass cups and screws. Glaze top panel with $\frac{1}{4}$ in. British polished plate (or other) glass in wash leather and putty. The horizontal moulding of bottom panels on the outer side to be weathered off, and a 3 in. × 2 in. moulded and throated deal weather stop screwed on to the bottom rail (or a metal weather stop as mentioned in the notes under clause No. 255). Put an $1\frac{1}{4}$ in. (or $1\frac{1}{2}$ in.) bead butt (or flush) both sides, two-panelled, square-framed, movable shutter, with two brass stubs and plates, and a 3 in. brass thumb screw.

If glazed with leaded lights, see Glazier, clause No. 10 and notes to same. The upper panel may be in the form of a sash, as in clause No. 258, and hinged for ventilation and provided with fastenings. If an iron grille be required instead of a shutter, allow a p.c. amount, and state that it is to be either screwed on, or made movable with stubs, plates and bolts; see Smith, clause No. 58.

Then describe the frame, the linings, furniture and fanlight somewhat as in clause No. 255.

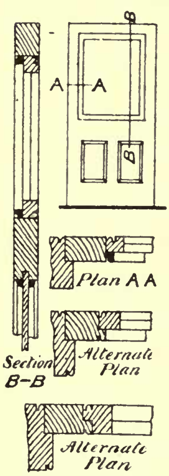


State if the centre panel be divided into marginal lights, and give the size of the bars, such as $1\frac{1}{4}$ in. or $1\frac{1}{2}$ in. wide, and if provided with movable beads.

For mat space see clause No. 64; and Pavior, clause No. 2.

For front door bell see Bell Hanger, clauses Nos. 6, 9 or 10.

Doors fitted with a sash.



(258)—The top panel of an external door may be filled in with a glazed moulded sash with loose beads, and the edges of the sash on the inside beaded (or moulded) round. The door framing forming this panel is described as having a skeleton-framed top panel (there being no panels in it as with an ordinary door) with loose beads planted on the outer edge to form a rebate. The skeleton framing may be rebated out to receive the sash, with a bead or moulding on the outer edge. If the sash be the same or about the same thickness as the door, it is preferable to rebate it out.

A shutter may be provided to the sash, as in clause No. 257.

For mat space, see clause No. 64; and Pavior, clause No. 2.

External tradesmen's entrance door.

(259)—To be 2 in. (or $1\frac{3}{4}$ in.) wrought deal, square-framed, bead flush (or bead butt) and square four (more or less) panelled framing.

Then describe the frame, the linings, the furniture and the fanlight somewhat as in clause No. 255.

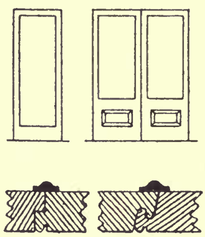
This class of door may be moulded and square, or square both sides; or the upper panels may be glazed, as in clause No. 257.

A shutter may be provided as in clause No. 257.

For mat space, see clause No. 64; and Pavior, clause No. 2.

For door bell, see Bell Hanger, clauses Nos. 6, 9 or 10.

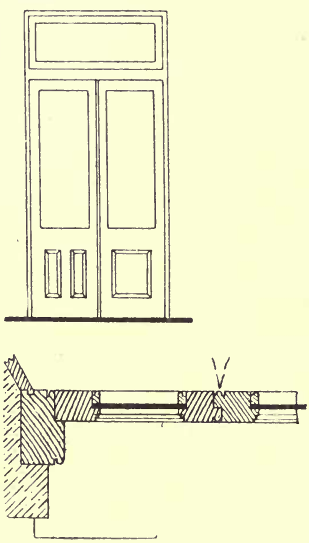
French casement doors.



(260)—These doors are either hung in one or two halves (folding), and may be described similar to clauses Nos. 257 or 258. When hung in two halves, instead of an outer bead being worked on the meeting style, either a metal or a wood weather stop may be screwed on, to assist in keeping out the weather. The meeting styles may have a hooked and beaded joint, instead of a rebated and beaded joint, as well as having the weather stop.

Casement doors are usually employed as an exit into the open from a living room. They may be in one, two or three panels, the upper panel being in glass. State if there be a fanlight, as in clause No. 255.

Shop or other external doors in two halves.



(261)—To be 2 in. ($2\frac{1}{4}$ in. or $2\frac{1}{2}$ in.) wrought deal (mahogany or oak), square-framed, three (more or less) panel moulded framings, hung folding in two halves, with rebated and beaded (or moulded) meeting styles, the lower panels being bolection moulded on both sides, the upper panels having rebated moulded diminished styles and top rails prepared for glass, with movable moulded beads, brass cups and screws. Glaze the upper panels with $\frac{1}{4}$ in. best British polished plate glass in putty and wash-leather. Hang each leaf on $1\frac{1}{2}$ pairs 5 in. brass (or wrought-iron) butts with gun-metal washers, and provide doors with four brass handles, p.c. 12s. each; one mortise lock and furniture, p.c. 10s.; two 12 in. and two 18 in. brass barrel (tower or flush) bolts; two brass spring door stops, p.c. 3s. each; one brass letter plate, p.c. 10s., with perforation through door; and a movable oak letter-box, 18 in. × 8 in. × 6 in. in clear, with glazed door, brass hinges, lock and two keys (or movable galvanised iron wire letter-box with lock and two keys).

With shop doors the letter-box is removed during the day. External doors, such as those to Public Houses and similar positions, which are subject to rough usage, often have the bottom rails protected with a brass casing let in flush and screwed on. The letter plate may be screwed on or fixed with bolts and nuts.

The frame to be $4\frac{1}{2}$ in. × 4 in. wrought deal (mahogany or oak), rebated and twice beaded (or twice moulded), grooved all round for linings, with cast-iron shoes let into threshold, and a $4\frac{1}{2}$ in. × 3 in. twice rebated and four times beaded (or four times moulded) transome, with small moulding tongued on the outer side.

Then describe the splayed linings, the architrave and fanlight, similar to clause No. 255. State if French or wax polished.

Rising butts are seldom used to this class of door.

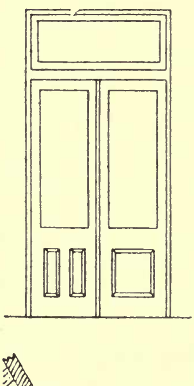
When both leaves of a folding door are required to open simultaneously, the hinges must be described as "sympathetic" hinges, p.c. 60s., instead of the usual butt hinges.

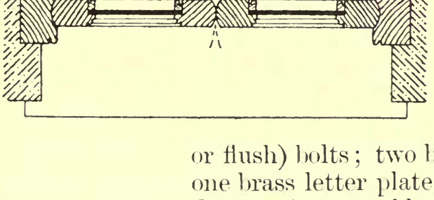
The least width suitable for folding shop doors is 3 ft. 6 in., but 4 ft. and even 5 ft. is often used.

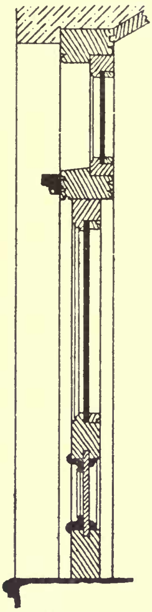
For mat space, see clause No. 64; and Pavior, clause No. 2. For bell, see Bell Hanger, notes to clause No. 9.

Shop or other doors to swing both ways.

(262)—To be 2 in. ($2\frac{1}{4}$ in. or $2\frac{1}{2}$ in.) wrought deal (mahogany or oak), square-framed, three (more or less) panel moulded framings with rounded styles, hung folding in two halves to swing both ways, the lower panels being bolection moulded both sides, and the upper panels having rebated moulded diminished styles and top rails, prepared for glass, with movable moulded beads, brass cups and screws. Glaze doors with $\frac{1}{4}$ in. best British polished plate glass in putty and wash leather. Each leaf is to be hung to swing on patent brass-cased steel spring hinges, p.c. 30s. a pair; and provided with two brass handles, p.c. 12s. each; one brass padlock, chain and staple, p.c. 15s., with the staples bolted through the door with nuts; two 12 in. and two 18 in. brass barrel (tower or flush) bolts; two brass spring door stops, p.c. 3s. each; one brass letter plate, p.c. 10s., with perforation through door, and a movable oak letter-box, 18 in. × 8 in. × 6 in.







in clear, with glazed door, brass hinges, lock and two keys (or movable galvanised iron wire letter-box with lock and two keys).

The frame to be $4\frac{1}{2}$ in. × 4 in. wrought deal (mahogany or oak), rebated for fanlight, hollow rebated for doors, twice beaded (or twice moulded), and grooved all round for linings; with cast-iron shoes let into threshold, and a $4\frac{1}{2}$ in. × 3 in. rebated, weathered, throated and four times beaded (or four times moulded) transome, with small moulding tongued on the outer side.

Then describe the splayed linings, the architrave and fanlight, similar to clause No. 255. State if French or wax polished.

See notes to clause No. 261 for metal plates to bottom rails of doors; and for the fixing of the letter plate.

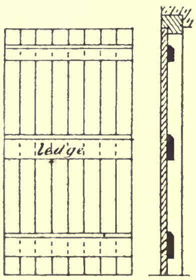
For mat space, see clause No. 64; and Pavior, clause No. 2.
Swing doors cannot be rebated into the framing at the head.
For bell, see Bell Hanger, notes to clause No. 9.

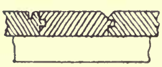
LEDGED DOORS AND GATES.

(Clauses Nos. 263 to 273a).

Coal cellar and other outside ledged cellar doors.

(263)—Each outside cellar door to be formed with:—1 in. (or $\frac{3}{4}$ in.) grooved and tongued, wrought both sides boarding in 7 in. widths, beaded one side (commonly called matched and beaded boarding), and nailed (or screwed) to an 1 in. (or $1\frac{1}{4}$ in.) × $4\frac{1}{2}$ in. wrought splayed top ledge, and 1 in. (or $1\frac{1}{4}$ in.) × 7 in. wrought splayed middle and bottom ledges, and hung on 16 in. (or 18 in.) cross garnett (or strap) hinges to a $4\frac{1}{2}$ in. × 3 in. wrought deal rebated door frame, notched out for ledges, and with cast-iron shoes let into stone threshold; and provided with a 12 in. iron Norfolk thumb latch, and oak stock lock, p.c. 7s.





The boarding may also be the ordinary grooved and tongued V-jointed boarding. In either case the tongues may be separate, when the boarding would be twice grooved, and should not be less than 1 in. thick.

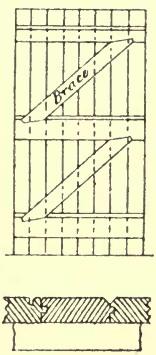
This is the commonest kind of door, and is mostly used in outhouses and outside cellars.

Cross garnett hinges are made 6 in., 8 in., 10 in., 12 in., 14 in., 16 in. and 18 in. long.

State if doors are to have padlocks instead of oak stock locks.

Ledged and braced doors.

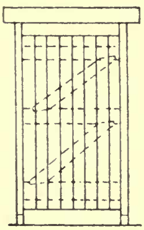
(**264**)—Each outside cellar door to be formed with:—



1 in. grooved and tongued, wrought both sides boarding in 7 in. widths, beaded one side (commonly called matched and beaded boarding), screwed to 1 in. (or $1\frac{1}{4}$ in.) $\times 4\frac{1}{2}$ in. wrought braces, 1 in. (or $1\frac{1}{4}$) in. $\times 4\frac{1}{2}$ in. wrought splayed top ledge, and 1 in. (or $1\frac{1}{4}$ in.) $\times 7$ in. (or 9 in.) wrought splayed middle and bottom ledges, and hung on 16 in. (or 18 in.) cross garnett (or strap) hinges to a $4\frac{1}{2}$ in. $\times 3$ in. wrought deal, rebated, once-chamfered door frame, notched out for ledges, with cast-iron shoes let into stone threshold; and provided with a 12 in. iron Norfolk thumb latch, and 8 in. oak stock lock (or padlock), p.c. 7s.

The boarding may also be as in either of the alternative ways mentioned in the notes to clause No. 263.

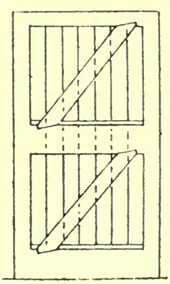
This is a better class of door than that in clause No. 263, and is suitable for outside w.c.'s and outside cellars, and in similar positions.



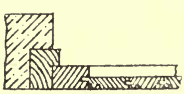
If this class of door be used in an outside w.c., it may be specified to be hung 3 in. (or 6 in.) clear of the threshold and door head for ventilation. A bolt and spring should be provided in lieu of a lock.

Framed and braced doors.

(**265**)—Each outside cellar door to be framed with:—



2 in. $\times 4\frac{1}{2}$ in. wrought deal, grooved and beaded styles and top rail, 2 in. $\times 9$ in. similar but splayed bottom rail, 1 in. $\times 9$ in. splayed middle (lock) rail, and 1 in. $\times 4\frac{1}{2}$ in. braces. Fill in with 1 in. wrought, grooved and tongued boarding in 5 in. (or 7 in.) widths, beaded one side (commonly called matched and beaded boarding), and hang on 4 in. wrought butts to a $4\frac{1}{2}$ in. $\times 3$ in. wrought deal, rebated and beaded door frame, with cast-iron shoes let into stone threshold; and provide with a 12 in. iron Norfolk thumb latch, and 8 in. oak stock lock, p.c. 7s.



State if the boarding be filled in diagonally.

The boarding may also be as in either of the alternative ways mentioned in the notes to clause No. 263.

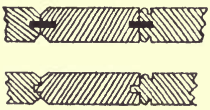
This is the best class of ledged door, and suitable for servants' outside w.c.'s, outside cellars, and in similar positions.

These doors are also made with the top and bottom rails and styles $1\frac{3}{4}$ in. thick, with 1 in. lock rail and braces and $\frac{3}{4}$ in. boarding; or if with 1 in. boarding, then with $\frac{3}{4}$ in. lock rail and braces. The braces and lock rail are less in thickness than the other part of the framing, because of the boarding going right over them from the top to the bottom rail. The boarding sometimes goes over the bottom rail as well, when of course the bottom rail would also be of less thickness.

In a 2 in. door, when the braces and lock rail are only $\frac{3}{4}$ in. thick, then the boarding may be $1\frac{1}{4}$ in. thick.

The boarding may either be beaded or V-jointed on both sides if 1 in. or $1\frac{1}{4}$ in. thick. It can only be beaded or V-jointed one side if in $\frac{3}{4}$ stuff.

If beaded or V-jointed both sides, the description of the boarding would be :—



1 in. (or $1\frac{1}{4}$ in.) wrought deal, twice grooved boarding, beaded (or V-jointed) on both sides, fixed together with loose cross tongues.

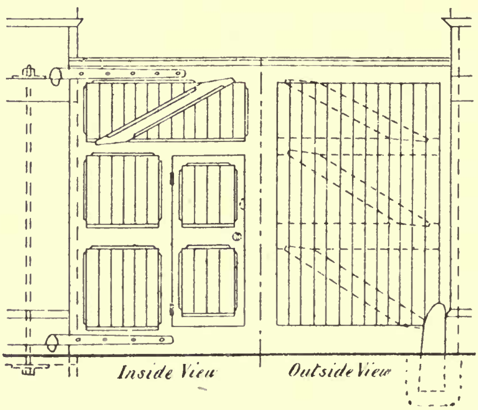
The tongues may also be formed on the boarding, when either beaded or V-jointed on both sides.

The framing may be stop chamfered on the one side. The hinges may be strap or pivot hinges.

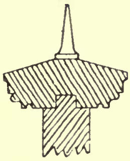
This class of door is also used for stables, coach houses, cart, carriage and garden gates; but see clauses Nos. 266 to 272 for gates and doors in these positions.

Cart (or carriage) gates hung to brick or stone piers.

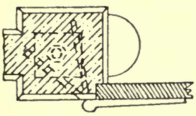
(266)—To be $2\frac{1}{2}$ in. wrought deal, grooved and V-jointed framings, stop chamfered on the inner side, with 9 in. (or 11 in.) × $2\frac{1}{2}$ in. splayed bottom rails, 9 in.



(or 11 in.) × $1\frac{1}{2}$ in. splayed lock rails, $5\frac{1}{2}$ in. × $1\frac{1}{2}$ in. splayed frieze rails and braces, 6 in. × $2\frac{1}{2}$ in. top rail,

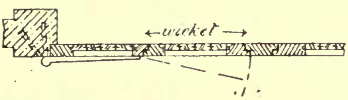


double rebated (or tongued) for capping, $5\frac{1}{2}$ in. × $2\frac{1}{2}$ in. outer styles, and 6 in. × $2\frac{1}{2}$ in. rebated and beaded meeting styles. Fill in with 1 in. deal, wrought, twice grooved and V-jointed both sides, oak tongued boarding in $4\frac{1}{2}$ in. (or $5\frac{1}{2}$ in.) widths. The capping to be 4 in. × 3 in. deal, wrought, grooved, twice moulded, twice weathered (saddle-back) and twice throated, with wrought-iron cresting 3 in. deep, p.c. 3s. per foot run, screwed on with countersunk screws.



Hang each gate on one 3 ft. 6 in. and one 3 ft. patent cup and ball hinges, fixed with $\frac{1}{2}$ in. bolts, nuts, heads and washers, the longer hinge being fixed to the top rail. The hinges to have long jaws, let into 6 in. rubbed York hinge stones the full size of the piers, with 1 in. diameter wrought-iron bolts taken down the piers connecting the hinge stones together, and secured to 9 in. × 9 in. × $\frac{1}{2}$ in. wrought-iron plates, nuts and heads.

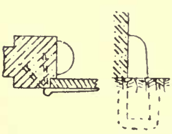
Fasten gates with a patent double lock vertical stay, p.c. 30s., and one cast-iron fall-down stop, let into a granite block bedded in concrete.



Form a wicket, showing flush on the outside, with similar framing and boarding, the framing being $4\frac{1}{2}$ in. wide and rebated to the main framing, and hung on $4\frac{1}{2}$ in. wrought-iron (or brass) butts, and provided with mortise lock and two keys, p.c. 8s.; two 4 in. diameter flush ring handles; one bullet catch; and two 6 in. barrel bolts.

If, instead of the wicket, a side entrance gate be required, it might be made 4 ft. or 3 ft. 6 in. wide, and formed and hung in the same way as described to the cart gates, but provided with a lock.

If the boarding to the gates be $1\frac{1}{4}$ in. instead of 1 in. thick, then the lock and frieze rails and braces would be $\frac{1}{4}$ in. less in thickness.



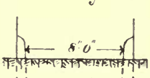
Put two wrought-iron ball catches, p.c. 10s. each, let into concrete, and with striking plates fixed on gates.

Bed in concrete two granite spur blocks out of 12 in. diameter one way, 8 in. through the other way and 3 ft. deep, and rounded off on top.

For gas, see clause No. 267 modified; and for bell, see Bell Hanger, clauses Nos. 6, 9 or 10.

The gates may be 3 in. thick, according to the width of the opening; $2\frac{1}{2}$ in. being sufficient up to 9 ft. wide, and 3 in. from 6 ft. to 12 ft. or 13 ft. wide.

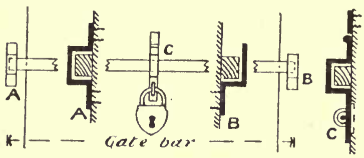
A stone threshold, either York or granite, some 9 in. to 12 in. deep, bedded on concrete, may be described between the piers; or else granite setts may be employed, see Pavior, clause No. 10.



Cart gates should not be less than 8 ft. wide clear of the spurs, 9 ft. and 9 ft. 6 in. being preferable. Carriage gates may be made as wide as 13 ft. or 14 ft., the width being governed by the class of house and accessibility from the road. Thus, in a very narrow road a carriage has to drive in on the skew, and cannot obtain an entrance directly opposite the gates. But when there is plenty of road space, gates 10 ft. wide will be ample.

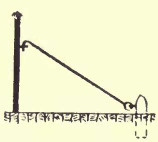
The height of cart and carriage gates may be made any height required, according to the circumstances of the case and the privacy required. Perhaps 6 ft. 6 in. should be a least height for the ordinary amount of privacy required.

The length of the hinges depends upon the width of the gates.



Instead of a patent vertical gate stay, a wrought deal gate bar, about 4 in. × 4 in., is sometimes used for cart gates, with 3 in. × $\frac{1}{4}$ in. wrought-iron strap staples at either end fixed to deal blocks; and a 3 in. × $\frac{1}{4}$ in. wrought-iron hinged strap locking staple, with eye plate and padlock at the centre, all being fixed with countersunk screws. Or the gates may be fixed similar to coach house doors, see clause No. 270.

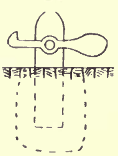
or,



An 1 in. bar iron rod may be provided, hooking into an eye on the gate at the one end, and fixed to an eye and plate at the other end, screwed to a deal or oak post let into the ground and bedded in concrete. A lock and bolt would be required to the gate in this case.

or,

If the gate be not very high, a padlock with hasp and staples and two brass bolts may be supplied.



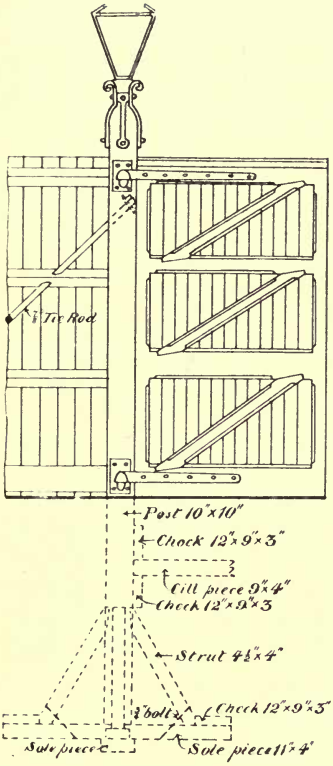
The ball catch may be screwed to 8 in. × 8 in. wrought posts, shaped off at the top and let into the ground some 2 ft. and bedded in concrete, instead of the catches being bedded directly in the concrete without posts.

Cup and ball hinges are made in 1 ft. 6 in., 1 ft. 9 in., 2 ft., 2 ft. 3 in., 2 ft. 6 in., 2 ft. 9 in., 3 ft., 3 ft. 3 in., 3 ft. 6 in., 4 ft., 4 ft. 6 in., 5 ft., 5 ft. 6 in., and 6 ft. lengths.

The upper hinge should be about three-fourths the width of gate.

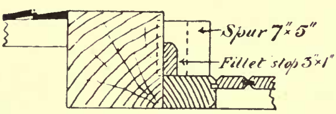
Cart (or carriage) gates in line with wooden fencing.

(**267**)—Plant a 3 in. × 1 in. wrought, chamfered oak fillet stop on to each of the 10 in. × 10 in. wrought all round deal (or oak) posts, having the sharp arrises slightly taken off, and carried down 6 ft. below the ground line, the tops being shaped to receive the lamps, and each of the feet framed with two 11 in. × 4 in. (or 12 in. × 6 in.) sole pieces, secured together with two dog irons 18 in. long, and four $4\frac{1}{2}$ in. × 4 in. struts bolted to sole pieces with $\frac{3}{4}$ in. bolts, nuts, heads and washers, and fitting against 12 in. × 9 in. × 3 in. chocks spiked on to ends of sole pieces. Take a 9 in. × 4 in. (or 12 in. × 6 in.) sill piece connecting the two posts together, and fitted at each end between two 12 in. × 9 in. × 3 in. chocks spiked to posts. Put on the outside two 7 in. × 5 in.

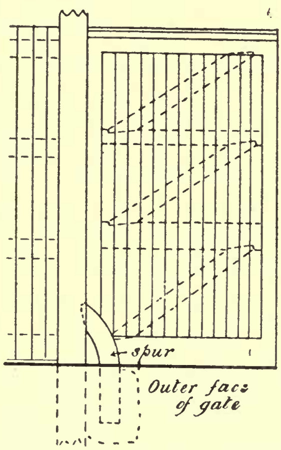


English oak spurs, cut out of a natural bend in the wood with the grain horizontal, and frame into posts and bed 2 ft. down in the ground in concrete. Take two $\frac{7}{8}$ in. wrought-iron tie rods through posts, with nuts, heads and washers, and secure to 9 in. × 6 in. × 3 ft. deal blocks, bedded 3 ft. down in the ground in concrete.

The gates to be $2\frac{1}{2}$ in. (or 3 in.) wrought deal, grooved and V-jointed framings, stop chamfered on the inner side, with 11 in. × $2\frac{1}{2}$ in. (or 3 in.) splayed bottom rails, 11 in. × $1\frac{1}{4}$ in. (or $1\frac{3}{4}$ in.) splayed lock rails, $5\frac{1}{2}$ in. × $1\frac{1}{4}$ in. (or $1\frac{3}{4}$ in.) splayed frieze rails, 6 in. × $2\frac{1}{2}$ in. (or 3 in.) top rails, double rebated for capping, $5\frac{1}{2}$ in. × $2\frac{1}{2}$ in. (or 3 in.) outer styles, $5\frac{1}{2}$ in. × $1\frac{1}{4}$ in. (or $1\frac{3}{4}$ in.) braces, and 5 in. × $2\frac{1}{2}$ in. (or 3 in.) rebated and beaded meeting styles. Fill in with $1\frac{1}{4}$ in. wrought deal, twice grooved and V-jointed both sides, oak tongued boarding in $5\frac{1}{2}$ in. widths. The capping to be 4 in. (or $4\frac{1}{2}$ in.) × 3 in. deal, wrought, grooved, twice moulded, twice weathered and twice throated, with wrought-iron cresting 4 in. deep, p.c. 3s. 6d. per foot run, screwed on with countersunk screws.



Hang each gate on one 5 ft. and one 3 ft. 6 in. patent cup and ball hinges, fixed with $\frac{1}{2}$ in. bolts, nuts, heads and washers, the longer hinge being fixed to the top rail, and the socket plates screwed to gate posts.



Then describe the gate stay, the fall-down gate stop, the wicket, the catches, the threshold, or paving setts, as in clause No. 266.

The gate bar may or may not be used.

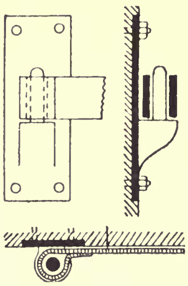
All woodwork buried in the ground is to be charred (or tarred), and cased all round in a solid block of concrete.

Sometimes the gate posts are surrounded with chalk instead of concrete.

Lay on $\frac{1}{2}$ in. galvanised wrought-iron gas barrel up the side of each gate post, and bored through 18 in. down from the top. Allow the p.c. sum of £8 for two gate lamps, and fix to posts with coach-headed screws.

If a side entrance gate be required in lieu of the wicket, it might be 4 ft. or 3 ft. 6 in. wide, and formed in the same way as the cart gates, but provided with a lock. It may be hung on cup and ball hinges, strap hinges, or else on one and a half pair of 4 in. wrought-iron butts.

Wrought-iron forged strap pivot hinges may be used, say $\frac{1}{2}$ in. metal 3 in. wide, diminishing to $2\frac{1}{2}$ in. $\times$ $\frac{3}{8}$ in. metal at the further end, and secured with $\frac{1}{2}$ in. bolts, nuts, heads and washers every 10 in. (to 12 in.) apart; the pivots being carefully formed, and the pivot plates secured with four (or three) $\frac{1}{2}$ in. bolts, nuts, heads and washers carried through the posts.



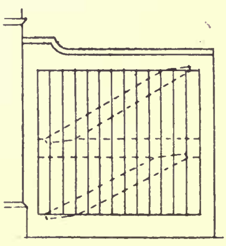
Two struts and one sole piece only may be provided to each of the gate posts, instead of the four and two respectively.

Sometimes the sole piece parallel with the gate runs through from post to post similar to the sill-piece, and connected to the sill-piece at the centre with a 6 in. $\times$ 4 in. vertical strut.

See notes generally under clause No. 266.

For bell, see Bell Hanger, clauses Nos. 6, 9 or 10.

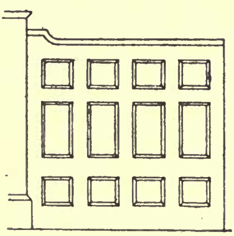
Cart or carriage gates with shaped top rail.



(268)—These may be similar to clauses Nos. 266 or 267, and fixed either to piers or posts; but no gate bar should be put to carriage gates leading to a carriage drive.

State if the top rails be "shaped" out, giving the size out of which they are cut. If the gates be very wide, a munting may be described at the centre.

See the notes generally to clauses Nos. 266 and 267.



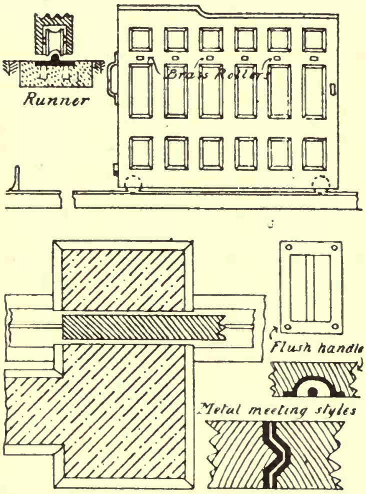
Panelled carriage gates may be described in a similar way to a panelled door, see clause No. 244. State if with raised panels or bolection moulded. Then describe the fixings, hinges and other items as in clauses Nos. 266 and 267. See notes generally under clauses Nos. 266 and 267.

In either case the fastenings, hinges, stops and other furniture and finishings, and threshold or paving would be similar as to cart gates, see clauses Nos. 266 and 267. State if the bottom moulding of panels is splayed off as in clause No. 255.

See clause No. 266 for gas; and for bell, see Bell Hanger, clauses Nos. 6, 9 or 10.

Sliding carriage gates.

(269)—The description of the framing might be the same as in clauses Nos. 244 and 268; but the furniture would be as follows:—



Each gate to be provided with one pair of patent gun-metal bushed wheels, 6 in. diameter, with plates let into bottom rail, and sliding on a $\frac{3}{4}$ in. metal cast-iron rounded runner 4 in. wide, with the guide standing up $\frac{3}{4}$ in., and let into a 12 in. × 9 in. rubbed hard York sill, and secured with screws into leaded, dovetailed holes. The sill to be bedded on concrete 2 ft. wide, 18 in. deep.

The meeting styles to have a gun-metal tongue and groove joint, and provided with two flush ring handles, a brass hook lock and two keys, p.c. 12s., and four brass flush handles, p.c. 3s. each, let in flush with the styles.

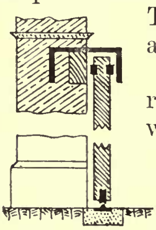
The outer styles to be provided with two brass pull handles, p.c. 3s. each, two brass plates with india-rubber buffers riveted on. Put two wrought-iron door stops fixed to the ends of stone sill.

The frieze rail to be provided on both sides with 1 in. diameter brass rollers every 18 in. apart, standing out from the face of the framing $\frac{1}{4}$ in., and each pier to have two 6 in. × 6 in. oak guide blocks carried through the centre the full width of the piers, to take the friction of the rollers.

Describe a wicket, and its ironmongery if required

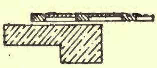
See notes generally under clauses Nos. 266 and 267.

The piers must be made sufficiently wide and strong to keep the gates in position when closed, as there is no gear at the top to steady them.



The gates must be made the full width of the piers, in addition to the width of the opening.

If the gates slide along the inner face of a wall, the rollers would be fixed in the top rail, and a channel iron with oak block be provided to form the guide; but in this case the top rails of the gates could not be shaped too much.

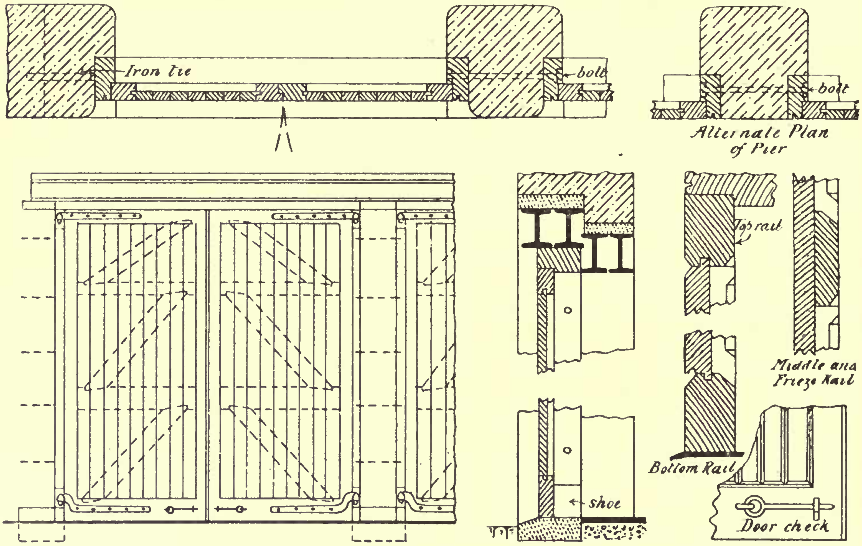


Open carriage gates and field gates.

(269a)—See clauses Nos. 330 and 331 respectively.

Coach house doors in a brick wall.

(270)—The coach house doors to be $2\frac{1}{2}$ in. wrought deal, grooved and V-jointed framings, stop chamfered



on the inner side, with 9 in. (or 11 in.) $\times\ 2\frac{1}{2}$ in. twice splayed bottom rails, 9 in. (or 11 in.) $\times\ 1\frac{1}{2}$ in. splayed lock rails, $5\frac{1}{2}$ in. $\times\ 1\frac{1}{2}$ in. splayed frieze rails, $5\frac{1}{2}$ in. $\times$ $2\frac{1}{2}$ in. top rails and styles, 6 in. $\times\ 2\frac{1}{2}$ in. rebated and beaded meeting styles, and $5\frac{1}{2}$ in. $\times\ 1\frac{1}{2}$ in. braces. Fill in with 1 in. deal, wrought, twice grooved and V-jointed both sides, oak tongued boarding in $4\frac{1}{2}$ in. widths, rebated and throated on bottom edge.

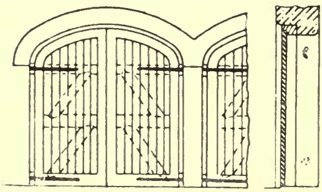
Hang each leaf with one 3 ft. 6 in. and one 3 ft. patent cup and ball hinges, fixed with $\frac{1}{2}$ in. bolts, nuts, heads and washers; the longer hinge being fixed to the top rail, and the socket plates screwed to the door frames with coach-headed (or countersunk) screws.

The frames to be 5 in. (or 7 in.) $\times$ 4 in. wrought, beaded and rebated oak (or deal), with cast-iron shoes let into threshold, and secured to centre piers of brickwork with $\frac{3}{4}$ in. bolts, nuts, heads and washers every 2 ft. apart, and to the side piers of brickwork with 2 in. $\times\ \frac{1}{4}$ in. wrought-iron ties 18 in. long every 2 ft. apart, with the wall ends turned up and down, and the other ends screwed to the door frames.

Supply each pair of doors with a $2\frac{1}{2}$ in. (or 3 in.) $\times$ $\frac{1}{4}$ in. wrought-iron hinged swivel bar with knuckle joint, hasp, staple, eye plate and padlock, p.c. 5s.; two 12 in. and two 36 in. 1 in. $\times\ \frac{3}{4}$ in. monkey-tail bolts with floor sockets; and four pointed (or forked) door checks with plates screwed on with countersunk screws.

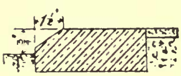
If $1\frac{1}{4}$ in. boarding be required to the doors, then the lock and middle rails and braces would be $1\frac{1}{4}$ in. thick.

State if frames and doors have segmental, semicircular, or elliptical heads, and that the door heads are put together with oak keys and wedges (or handrail screws) or with oak pins, as in the notes to clause No. 255. If square headed, a bressummer or rolled iron or steel joist, with stone templates and cover stone, must be taken.



The clear width of opening for coach house doors should not be less than 6 ft. for ordinary carriages, 6 ft. 6 in. and even 7 ft. 6 in. being preferable. Carriages are not often more than 5 ft. 6 in. wide. The height of a carriage does not exceed 6 ft., the doors may therefore be 7 ft. as a least height, see Pavior, notes to clause No. 13, for sizes of carriages.

The door frames may rest upon York stone blocks the full width of the wall by about 21 in. wide and 18 in. deep; and a York threshold may be placed in between the openings some 7 in. thick, kept up $\frac{3}{4}$ in. above the yard and chamfered off; see Mason, clause No. 61.

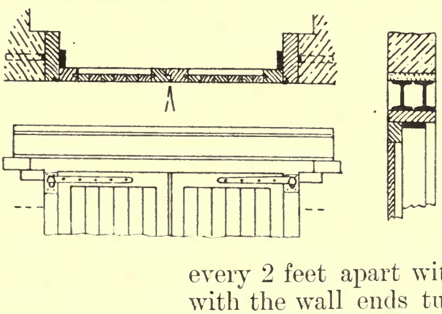


Two wrought-iron ball catches may be provided for each pair of doors instead of the four forked door stops; see clause No. 266.

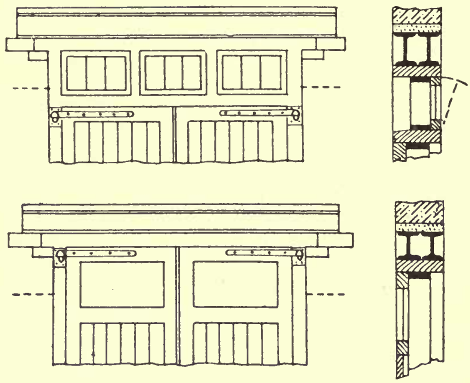
Barrel bolts are perhaps preferable to square bolts, as square bolts set very hard and it is difficult to use them, especially if the doors twist slightly. Horizontal wood door bars are not much used now for coach house doors.

Coach house doors in a thin wall.

(271)—When the brick or stone piers are not sufficiently strong for building in the frame, then the coach house doors may be hung to a wrought deal beaded frame and head some 9 in. wide × $4\frac{1}{2}$ in. thick, with the horns projecting some 6 in. to 9 in. in length, and bearing on 3 in. × 9 in. × 9 in. York templates, and the feet cased in cast-iron shoes let into the stone threshold, the posts being secured to the brickwork every 2 feet apart with wrought-iron ties 18 in. long, with the wall ends turned up and down, and the other ends screwed to the door frames. A $2\frac{1}{2}$ in. × $\frac{3}{4}$ in. (or 1 in.) wrought deal fillet must be planted round the frame and head as a door stop; or the frame may be rebated out. There would be the ordinary bressummer or rolled iron or steel joist, with stone templates and cover stone over to carry the weight of the brickwork above.

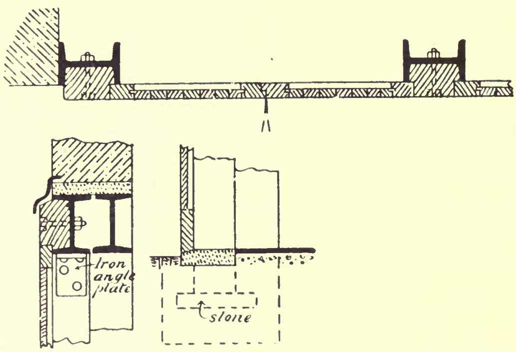


The description of the doors would remain the same as clause No. 270.



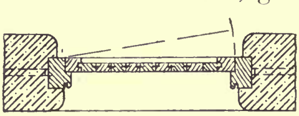
When light cannot be obtained elsewhere in a coach house, it is necessary to put fanlights over the doors, which may be described as ordinary fanlight sashes with strong bars, see clause No. 255; but if there be not sufficient height for this, then the top panels of the doors may be glazed with rough plate $\frac{1}{4}$ in. thick fixed into rebates with loose beads.

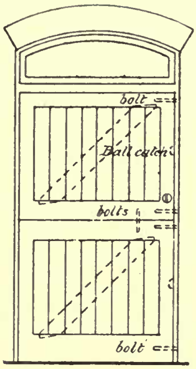
When space is very limited, it may be necessary to construct the hanging posts for coach house doors in iron or steel. The posts (or stanchions) and head may be of rolled iron or steel joists, fitted with twice rebated and twice beaded oak or deal posts and head facing pieces 5 in. thick by the width of the stanchion, and bolted through with $\frac{1}{2}$ in. bolts, nuts, heads and washers every 2 ft. apart. The iron stanchions and head are bolted together with $\frac{1}{2}$ in. iron angle plates, and the feet may be bedded on a 6 in. York stone base surrounded in concrete. Instead of rolled iron or steel joist stanchions, they may be the usual cast-iron stanchions with the head and bottom plates cast on, see clause No. 37, under Smith.



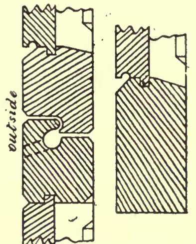
External stable door.

(272)—Each external stable door to be $2\frac{1}{2}$ in. wrought deal, grooved and **V**-jointed framings in two heights, stop chamfered on the inner side, the lower half having 9 in. (or 11 in.) × $2\frac{1}{2}$ in. twice splayed bottom rail, 7 in. × $2\frac{1}{2}$ in. hook rebated, splayed and throated top rail, $5\frac{1}{2}$ in. × $2\frac{1}{2}$ in. styles, and one $5\frac{1}{2}$ in. × $1\frac{1}{2}$ in. brace. The upper half of door to have 7 in. × $2\frac{1}{2}$ in. twice splayed, rebated and hollow-grooved bottom rail, the styles, top rail and brace being similar to the style and brace of the lower half of door. Fill in with 1 in. deal, wrought, twice grooved and **V**-jointed both sides, oak tongued

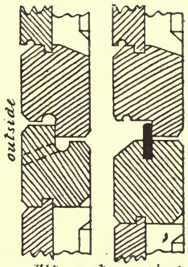




boarding in $4\frac{1}{2}$ in. widths, rebated and throated on the bottom edges. Hang each half with 2 ft. 6 in.

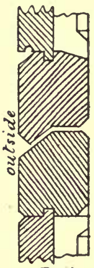


Meeting Rails and Bottom Rail to doors opening inwards



Alternate methods for Meeting Rails

patent cup and ball hinges, fixed with $\frac{1}{2}$ in. bolts, nuts, heads and washers, the socket plates being screwed to door frame, with coach-headed (or countersunk) screws. The transome to be twice rebated and four times beaded, and the frame once rebated and twice beaded in 5 in. $\times$ 4 in. wrought oak (or deal), with cast-iron shoes let into threshold and frame secured to brickwork with 2 in. $\times \frac{1}{4}$ in. wrought-iron ties 18 in. long every 2 ft. apart, with wall ends turned up and down, and the other ends screwed to the door frame.



Meeting Rails when doors open outwards

Put to each door five 6 in. brass barrel bolts, two brass spring ball catches, one brass flush ring handle, p.c. 3s., and two brass door catches (or cabin hooks and eyes). Fill in each fanlight with a 2 in. moulded deal sash with movable beads, and hang on one pair $3\frac{1}{2}$ in. brass butts, and provide with brass spring catch and two brass fanlight stays, and glaze with 26 oz. sheet glass in putty.

The stone thresholds may be similar as in the notes to clause No. 270; and see Mason, clause No. 61.

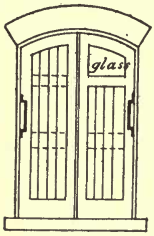
Ironwork should not be used for door or window furniture in stables, as it soon corrodes and gets out of order. Brass or gun-metal should be used.

Stable doors should not be less than 3 ft. 6 in. clear opening, 3 ft. 9 in. and 4 ft. being preferable, by about 7 ft. 9 in. high.

By arranging the bolts as shown on the sketch, it will be seen that either the upper or lower half of the door can be opened singly, or the two halves together. By merely pushing the doors the ball catches keep the two doors shut when the bolts are not shot, the flush ring handle in this case being provided merely for pulling the doors open, and not acting as a latch. If brass latches and locks are required in lieu of the ball catches, allow a p.c. sum.

For sizes of stall and loose box divisions, and fittings to stables, see Smith, notes preceding clause No. 109, and Smith, clauses Nos. 109 to 111.

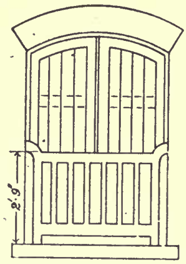
Loft door.

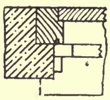


(273)—Loft doors should be from 3 ft. 6 in. to 4 ft. wide, and hung folding; and may be described similar to coach house doors, see clause No. 270. The doors may be $2\frac{1}{2}$ in. thick, the frame 5 in. × 4 in., with shoes and wrought-iron wall ties, and the hinges either cup and ball or 4 in. wrought butts. Two or four brass (or iron) bolts, two brass handles, and two wrought-iron handles 12 in. long screwed to door frame, should be provided.

Fix to wall a small crane for hoisting corn and hay, p.c. £3.

If there are no windows in the loft, the doors may be partly glazed. For stone thresholds, see clause No. 61 in Mason.





A movable guard is often placed in front of loft doors to prevent the coachman's children falling out, and may be described as $3\frac{1}{2}$ in. × 2 in. wrought deal skeleton framing, with styles rounded at top, and $1\frac{1}{2}$ in. × 2 in. vertical bars spaced 2 in. (to 3 in.) apart, and made movable to slide between the door frame and 2 in. × $1\frac{1}{2}$ in. rounded fillets secured to plugs in the wall.

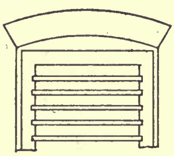
Cow house doors.

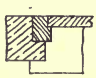
(273a)—Doors to openings where beasts pass through, or where it is necessary to take barrows, should not be less than 4 ft. wide in the clear. Doors to cow houses and like positions should be described in two halves, similar to stable doors, see clause No. 272. Ledged and braced doors are often used in these positions, see clause No. 264, but with ironmongery somewhat similar to clause No. 272.

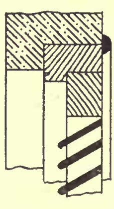
For sizes of cow stalls, divisions, and other farm requirements, see Smith, clause No. 112.

Louvred doors.

(274)—Louvred doors are generally required for ventilation in various places, and may be described as:—







2 in. ($2\frac{1}{4}$ in. or $2\frac{1}{2}$ in.) wrought deal, beaded, skeleton framing, grooved for louvres, having $4\frac{1}{2}$ in. (or $5\frac{1}{2}$ in.) styles and top rail, 9 in. (or 11 in.) splayed bottom rail, and $\frac{3}{4}$ in. splayed and beaded louvres placed 1 in. apart at an angle of 45° and projecting $\frac{1}{2}$ in. out beyond the face of framing, and housed into styles.

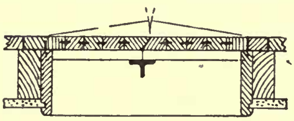
Hang each door on one pair 4 in. wrought-iron butts, to a $4\frac{1}{2}$ in. × 3 in. beaded and rebated frame with iron shoes and wall ties, and finished with a $1\frac{1}{2}$ in. × 1 in. bead moulding round as architrave, and provided with oak stock lock and key, p.c. 8s.

Repairs to old doors and frames.

(275)—Cut out decayed and perished portions of doors, frames, linings and mouldings, and piece out with new. Put entirely new ironmongery.

Trap door in floor.

(276)—Trim joists with trimmers 4 in. wide, for a trap-door opening 4 ft. × 2 ft. 6 in., line round with $1\frac{1}{2}$ in. wrought deal rounded cross-tongued linings grooved for plaster, and finished with a $3\frac{1}{2}$ in. × $1\frac{1}{4}$ in. mitred floor border. The trap door to be hung folding, with splayed meeting joint, on 18 in. wrought-iron strap hinges, and framed together with $4\frac{1}{2}$ in. × $1\frac{1}{2}$ in. (2 in. or $2\frac{1}{2}$ in.) wrought deal ledges, and $1\frac{1}{2}$ in. (2 in. or $2\frac{1}{2}$ in.) wrought deal, grooved and tongued flush boarding, and provided with two 2 in. diameter wrought-iron flush rings bolted through, and a 2 in. × 2 in. movable tee-iron centre bar support.



The boarding may be V-jointed, or matched and beaded on the under side.

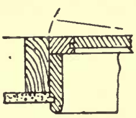
The flaps may show panels on the under side, either plain or moulded.

The hinges may be ordinary wrought-iron butts.

The linings may be sunk and beaded, or even panelled.

Trap door in ceiling to roof, with step ladder.

(276a)—Trim joists with trimmers 3 in. thick, for a trap-door opening into roof, 2 ft. 6 in. × 2 ft. 6 in. Put an $1\frac{1}{4}$ in. wrought deal one-panel square door, hung with $3\frac{1}{2}$ in. wrought-iron butts to $1\frac{1}{4}$ in. (or 1 in.) wrought deal beaded linings grooved for plaster, and provided with a 3 in. brass cabin hook and eye for fastening on the under side, and a 6 in. iron cabin hook and eye for securing on the roof side when open.



The trap door may be moulded on the under side. The linings may be similar to those mentioned to a trap door in clause No. 276.

For trap doors in roofs, see clauses Nos. 92 and 93.

Step ladder.

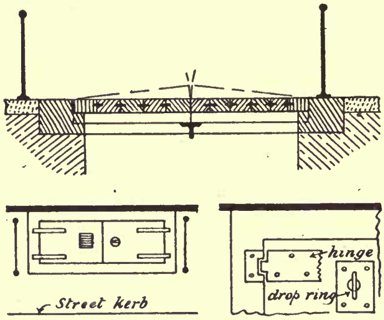
The step ladder to trap door in ceiling to be 15 in. wide, and formed with $1\frac{1}{2}$ in. wrought beaded strings, and $1\frac{1}{4}$ in. wrought rounded treads housed and dovetailed through. Fix to strings of ladder and to lining of trap door wrought-iron hooks and eyes, and provide with lines, cleats, pulleys and fastenings for raising ladder when out of use (or else provide brackets on wall upon which to hang the ladder).

or,

Provide a light wrought-iron step ladder to trap door in ceiling, formed with $1\frac{1}{2}$ in. × $\frac{3}{8}$ in. strings and $\frac{3}{4}$ in. barrel rungs, hinged with hooks and eyes, and provide with lines, cleats, pulleys and fastenings for raising ladder when out of use (or else provide brackets on wall upon which to hang the ladder).

For access to the rooms in roof of small property, where the landing space is cramped, a flight of stairs is made somewhat similar to a step ladder, which may be raised and lowered at will by balance weights.

Cellar flaps.



(276b)—Cellar flaps may be formed in a similar way to a trap door in a floor, with the boarding and ledges $1\frac{1}{2}$ in. (or 2 in.) thick, and either in deal, oak or teak. The frame (kerb) should be in oak or teak about 6 in. × 4 in., rebated and notched out to receive the flaps, and two iron or brass barrel bolts (or padlock) provided on the under side for fixing, as well as the flush rings for opening. An iron grating may be required for ventilation, say 9 in. × 9 in. or 12 in. × 12 in. and screwed in.

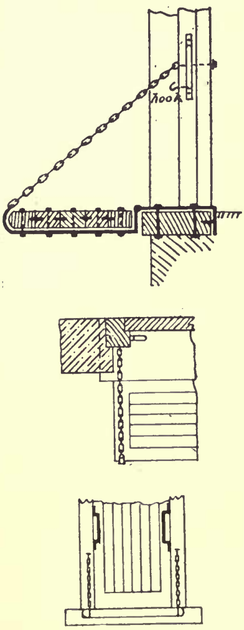
Allow the p.c. sum of £3 for two movable safety guards, to be fixed in position when the flaps are open for the protection of passers-by.

Cellar flaps may be glazed like pavement lights, or may be entirely in iron.

State if a step ladder is required, either in iron or wood.

Sometimes steps in brick or stone are provided from the cellar flap level to the cellar.

Loop-hole frame, door and flap.



(277)—A loop-hole frame is a name given to a door in a warehouse or factory, through which goods are hauled up to the various floors.

The door and frame might be described similar to clause No. 273 (or larger), and in addition state:—

The sill to be in oak, 5 in. × 12 in., weathered on top. Form flap with a 3 ft. projection and rounded nosing in oak (or deal) 3 in. (or $2\frac{1}{2}$ in.) thick, framed together, and filled in with similar boarding in 7-in. widths, grooved and tongued together with $1\frac{1}{2}$ in. × $\frac{1}{8}$ in. galvanised iron tongues, and hung on one pair of 3 in. × $\frac{3}{8}$ in. wrought-iron strap hinges with knuckle joints. Each hinge to be bolted to the sill with two $\frac{1}{2}$ in. (or $\frac{5}{8}$ in.) bolts, nuts, heads and washers, and one 3 in. coach screw, and bolted to the flap with five $\frac{1}{2}$ in. bolts, nuts, heads and washers. The outer end of hinges to have forged eyes, and slung from door posts with forged wrought-iron link chains to carry 3 (more or less) cwts., and secured to door frame with eyes and plates bolted through. Screw on to the side of door frame two wrought-iron handles 12 in. long; and two wrought-iron hooks for looping chain to when flap is drawn up.

For crane, see Smith, clause No. 73.

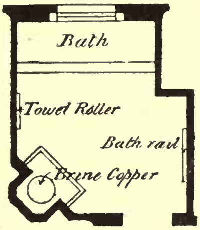
The door frame must be well secured to the walls or to a story post.

Bath Casing and Bath Room Fittings.

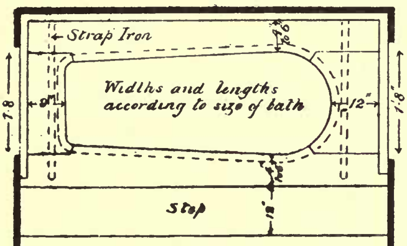
(Clauses Nos. 278 to 280.)

Bath enclosure in mahogany.

(278)—The bath framing to be in well selected, clean, wrought Honduras mahogany, French polished and formed with :—

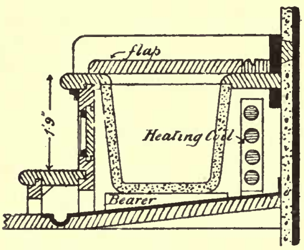


$1\frac{1}{4}$ in. (or 1 in.) framed top, on deal bearers, perforated for tapered bath with semicircular end, thumb moulded on inner edge, rebated on the under side to receive top edge of bath, grooved for riser, rounded on the outer edge with a small moulding under, and bedded on to bath in cement. Screw on the under side of top at each end a 2 in. $\times \frac{3}{16}$ in. wrought iron strap. (This iron strap assists in holding the top framing together.)



Plan shewing Bath-top without flap

The front (riser) beneath to be fixed to fillets and formed with $1\frac{1}{2}$ in. (or $1\frac{1}{4}$ in.) five (or other) panel moulded (or square) framing rebated to top, with hinged door for access to valves, hung on 2 in. brass butts, and provided with a 2 in. turnbuckle on plate, and $1\frac{1}{4}$ in. diameter brass rose knob.



Run a $4\frac{1}{2}$ in. $\times \frac{3}{4}$ in. square skirting round top, dovetailed at angles, with quadrant ends, and secured to narrow double splayed deal grounds (the skirting may be rebated to a groove in the bath top).

The top and riser to be made movable with brass flush bolts (or brass cups and screws).

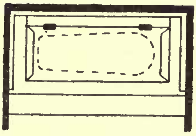
The least length and width of a bath top should not be less than 12 in. and 8 in. more respectively than the size of the bath. For sizes of baths, see Plumber, clauses Nos. 37 to 46.

Step to bath.

Form step $1\frac{1}{2}$ in. (or $1\frac{1}{4}$ in.) thick in Honduras mahogany, with rounded nosing, rebated to a groove in bath riser, and with an 1 in. mahogany riser rebated to a groove in the tread, and glued, blocked and bracketed together, and perforated to shape, so as to give a view of the bath safe, and made movable with brass flush bolts (or brass cups and screws).

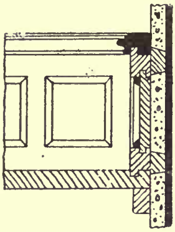
A step is not required if the top of the bath is not more than about 21 in. from the floor. In this case the bath riser might be perforated to give a view of the safe, or a 6 in. $\times \frac{3}{4}$ in. skirting might be fixed as a finish.

Bath flap.



The flap to be $1\frac{1}{4}$ in. (1 in.) thick, tongued and grooved, mortise and mitre clamped Honduras mahogany, rounded on three edges, and hung with one and a half pairs of 3 in. brass butts on $1\frac{1}{4}$ in. (or 1 in.) $\times 3\frac{1}{2}$ in. beaded mahogany fillet (hanging) piece, and provided with a 2 in. brass cabin hook and eye, and a $2\frac{1}{2}$ in. brass flush ring.

Back and elbows.



Instead of a skirting round the back and sides of the bath, there may be an $1\frac{1}{2}$ in. (or $1\frac{1}{4}$ in.) six (or other) panel moulded (or square) mahogany back and elbows 15 in. (to 18 in.) high, rebated to grooves in the bath top and capping, rebated and grooved at angles, staff beaded at ends, and with a moulded (or beaded) capping 3 in. girth, returned and mitred at ends, and secured to double splayed narrow deal backings.

If heating pipes or a coil be placed inside the bath casing in order to keep the bath warm, then state that one (or more) of the panels in the bath riser are to be filled in with brass or iron perforated gratings for ventilation. Care should be taken in bedding the bath top on to the bath in cement, so that no draught may be felt at the joint.

Bath framings may be formed in a similar way in pitch pine or other hard wood, deal or pine, and French polished. In very plain work the fronts or risers are formed of matched and beaded boarding.

Baths are more sanitary where there is no casing round.

Bath cradle.

Encase the copper (iron, steel or zinc) bath with a strong-framed, rough deal dovetailed cradle.

All metal baths, except cast-iron baths, require cradles, see Plumber, clause No. 42. Fire-clay baths do not require cradles.

Towel roller.

To be an 1 in. cased brass rod with ornamental brass brackets secured to wall. (It may be as in clause No. 288.)

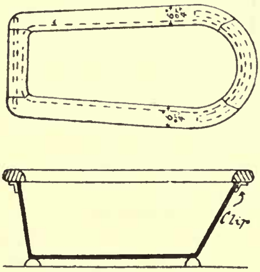
Bath rail.

To be a $4\frac{1}{2}$ in. $\times$ 1 in. wrought mahogany (or deal) rail 5 ft. long, moulded (or beaded) on all edges, screwed to plugs in wall, varnished (or French polished), and provided with brass cloak hooks every 9 in. apart (or japanned malleable iron cloak hooks). (See sketch to clause No. 235).

Salt water or brine copper.

See clause No. 280.

Bath rim.



(279)—Baths (usually cast iron) that have no top or casing round may be provided with an $1\frac{1}{4}$ in. (or $1\frac{1}{2}$ in.) × 6 in. (or 4 in.) wrought, framed, French polished Honduras mahogany rim, perforated for tapered bath, with thumb moulding on inner edge, and semicircular at end, rebated on the under side to receive top edge of bath, rounded on the outer edges, with rounded corners, and strapped together at each end on the under side with an $1\frac{1}{4}$ in. × $\frac{1}{8}$ in. wrought-iron strap, screwed on, and the rim secured to bath with brass clips.

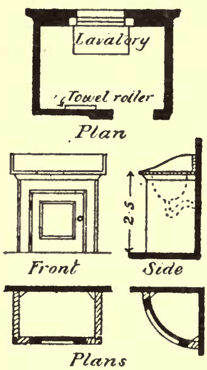
The rim may be in pitch pine or other hard wood, deal or pine, and French polished.

Salt water or brine copper.

(280)—It is very useful for heating brine or salt water, to fix an ordinary portable copper in a bath room, with a short length of iron flue pipe and 1 in. brass draw-off cock, see Smith, clause No. 68. From 20 to 25 gallons would be a fair size copper. Allow a p.c. sum.

The hearth and cheeks to the fireplace opening might be tiled similar to a dog grate, or else be built in glazed or enamelled brickwork, see Smith, clause No. 85; Pavior, clause No. 6; and Mason, clause No. 122.

Lavatory enclosure.



(281)—Enclose underneath lavatory with $1\frac{1}{4}$ in. (or 1 in.) wrought, French polished, Honduras mahogany, one-panel moulded (or square) door, hung with $2\frac{1}{2}$ in. brass butts in $1\frac{1}{4}$ in. (or 1 in.) beaded mahogany frame on fillets, rebated, grooved and staff beaded at angles, and provided with a 2 in. brass turnbuckle on plate, and $1\frac{1}{4}$ in. diameter brass knob.

Run a small mahogany moulding under lavatory as a finish, and put one $\frac{3}{4}$ in. wrought mahogany shelf on bearers inside.

State if it be a circular front to an angle lavatory.

Towel roller and coat hook.

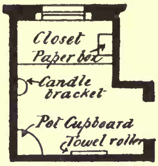
See under clause No. 278. Fix on door a brass coat hook.

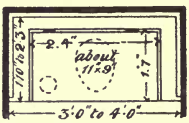
W.C. Casing and other Fittings.

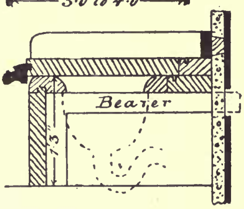
(Clauses Nos. 282 to 285.)

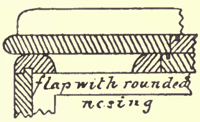
Mahogany W.C. framing.

(**282**)—The framing to each w.c. on ground and first floor to be in well selected, clean, wrought Honduras mahogany, French polished, and formed with :—









1 in. riser rebated to groove in seat.

1 in. seat, thumb moulded on front edge in beaded frame, with hole cut, dished and thumb moulded for pan, and hole cut and beaded for handle.

1 in. mortise and mitre clamped flap, with rounded (or moulded) nosing, tongued on to groove in front edge, and hung on $2\frac{1}{2}$ in. brass butts in beaded frame, and finished with a similar moulded nosing.

$\frac{3}{4}$ in. (or $\frac{1}{2}$ in.) square skirting $3\frac{1}{2}$ in. high, dovetailed at angles, with bull-nosed ends, and secured to double splayed narrow deal grounds. (The skirting may be rebated to a groove in flap frame.)

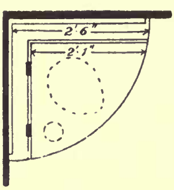
The whole of the mahogany framing to be put together with brass flush bolts (or brass cups and screws) for removing easily and secured to deal dovetailed legs and bearers plugged to walls.

Paint the under side of seat with two coats of silicate paint or Brunswick black.

This is an ordinary description of a w.c. framing. For a more costly framing see clause No. 283. Closet framings may be in any hard wood.

The riser may be hinged on a beaded frame on 2 in. brass butts, and provided with two brass flush bolts; or it may be rebated and grooved together in a beaded frame, when no fastenings would be necessary.

The least width of a w.c. seat is 1 ft. 10 in., but 2 ft. and 2 ft. 3 in. is better; the length may be from 3 ft. to 4 ft.



Here is a sketch of an angle closet, showing the least size required. Closet seats should not be fixed more than 15 in. or 16 in. from the ground (or step) for adults. For children they may be fixed as low as from 9 in. to 12 in. To obtain these low heights either the apparatus must be kept down or else a step provided. A w.c. is more sanitary when not cased in.

Step to closet.

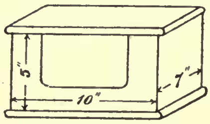
See Plumber, notes to clause No. 51, referring to a step.

If a step be required, describe it similar to a bath step, as under clause No. 278.

Towel roller and coat hook.

See under clause No. 278. Fix on door a brass coat hook.

Paper box.

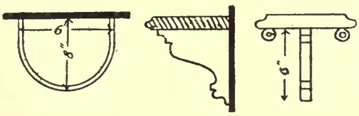


Each w.c. to have a ½ in. wrought Honduras mahogany dovetailed square (or quadrant) shaped, French polished paper box, rounded on top and bottom edges, with hole cut in front with rounded edges, and fixed to walls with brass eyes and hooks.

A paper box may also be formed in the seat of the closet in cedar wood, with beaded mahogany flap, hung on 2 in. brass butts, and provided with an 1½ in. brass ring.

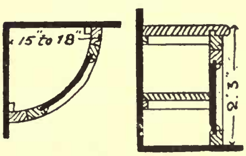
Often a metal roller with paper wound round is used instead of a paper box.

Candle bracket.



Each w.c. to have a French polished Honduras mahogany candle bracket, formed with ¾ in. moulded shelf and ¾ in. cut bracket, and fixed to wall with brass plates, eyes and screws.

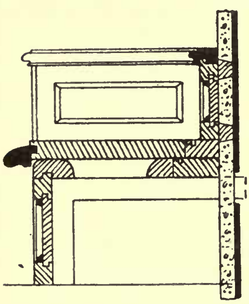
Pot (chamber) cupboard.



To be in clean Honduras mahogany, French polished, with 1 in. quadrant-shaped, one-panel, moulded (or square) circular door, hung on 2½ in. brass butts in 1 in. beaded frame, rebated to an 1¼ in. moulded and grooved top, and provided with a 2 in. brass turnbuckle on plate and 1½ in. brass knob, and fixed together on deal fillets. Put one ¾ in. wrought mahogany shelf on bearers inside.

Mahogany W.C. framing for high class work.

(283)—The framing to each w.c. on ground and first floor to be in well selected, clean Honduras mahogany, French polished, and formed with:—



1¼ in. (or 1 in.) one-panel, moulded (or square) riser, rebated to groove in seat.

1 in. mortise and mitre clamped seat, thumb moulded on front edge, grooved for riser, and hung on one pair 3 in. brass butts, in beaded frame, with cut, dished, thumb-moulded hole for pan, and hole cut and beaded for handle.

1 in. mortise and mitre clamped flap, with moulded (or rounded) nosing tongued on to groove in front edge, and hung with 3 in. brass butts in beaded frame, and finished with a similar moulded nosing.

1¼ in. (or 1 in.) four (or other) panel, moulded (or square) back and elbows 1 ft. 3 in. high, with staff bead at ends, rebated and grooved at angles, and rebated to a moulded (or beaded) grooved capping 3 in. girth on top, and fixed to double splayed, narrow deal framed grounds. (The elbows and back may be rebated to a groove in flap frame.)

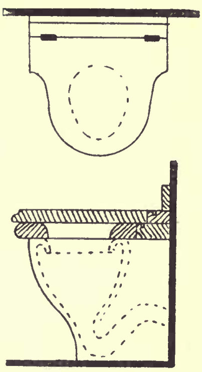
The whole of the mahogany framing to be put together with brass flush bolts (or brass cups and screws), for removing easily, and secured to deal dovetailed legs and bearers plugged to walls.

Paint the under side of seat with two coats of silicate paint, or Brunswick black.

The riser may either be hinged or work in a groove, see notes under clause No. 282.

For step to closet, paper box, candle bracket, pot cupboard, towel roller and coat hook, see under clause No. 282.

Closet seat and flap without riser.



(284)—Wash-down closets similar to clause No. 52 in Plumber are seldom cased in with woodwork, merely being supplied with a seat and flap, which is generally sold with the closet, and may either be in mahogany or white wood.

A description might run:—

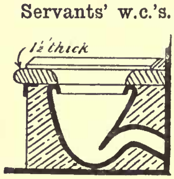
Form closet seat with $1\frac{1}{4}$ in. (1 in. or $1\frac{1}{2}$ in.) shaped and French polished Honduras mahogany, rounded on the outer edge, with hole cut, dished and thumb moulded for pan, and hinged on $2\frac{1}{2}$ in. brass butts to beaded fillet piece 6 in. wide, on wrought deal chamfered bearer plugged to wall. Paint the under side with two coats of silicate paint or Brunswick black.

Form flap in similar shaped, French polished mahogany, 1 in. thick, rounded on edge, and hung on $2\frac{1}{2}$ in. brass butts to beaded fillet piece 4 in. wide, with 4 in. $\times$ $\frac{1}{2}$ in. mahogany skirting rounded at ends, and screwed to wall with brass cups and screws. (The skirting may be rebated to a groove in the fillet piece.)

The description in white wood or deal would be similar, and might either be left in the plain wood or French polished.

For paper box, candle bracket, pot cupboard, towel roller and coat hook, see under clause No. 282.

Servants' w.c.'s.



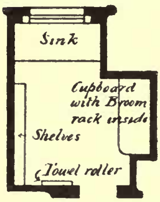
(285)—The woodwork may be in plain (or varnished) deal or white wood, and described similar as under clauses Nos. 282 or 284.

Closets for workmen may have merely a wood seat with a small angle fillet skirting round, and the closet pan be built in solid in brickwork. A small L iron may be screwed on to the under side of seat, and clipping on to the brickwork so as to keep the top course of bricks in place.

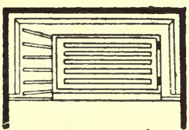
For trough closets or latrines, see Plumber, clause No. 54.

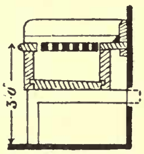
Housemaid's Sink and other Fittings.

Housemaid's sink. (286)—The housemaid's sink to be fixed on 3 in. × 3 in. wrought framed deal dovetailed legs and bearers, pinned into walls, and formed with:—



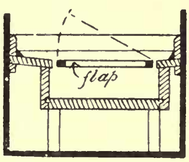
1¼ in. wrought deal, glued and dovetailed sink framing 2 ft. × 1 ft. 6 in. × 12 in. in the clear, with 1½ in. dovetailed (or grooved and rebated) bottom sharply dished out to the centre outlet, with an 1½ in. × 1½ in. rounded oak nosing piece screwed on front edge, and the sink prepared for lead.





1½ in. wrought fluted deal drainage board on wrought deal chamfered bearers, with a ½ in. × 2 in. rounded oak raised fillet on front edge, 7 in. × ¾ in. chamfered deal dovetailed skirting on grounds with rounded ends, and an 1 in. × 1 in. angle fillet round three sides, and the whole prepared for lead.

The flap to be 1¼ in. skeleton framed wrought oak, with 1¼ in. bars spaced ¾ in. apart, and hinged on 2½ in. brass butts.



The front of sink to be left entirely open.

The oak flap is to stand cans or jugs upon, and prevents the bottoms getting wet while being filled with water. The draining board is not always covered with lead. If doors are required in front of the sink, see under clause No. 287. The woodwork to sinks may be described with the leadwork, see clause No. 32 under Plumber. The tops of housemaids' sinks are fixed 3 ft. up from the floor.

Towel roller. See under clause No. 288.

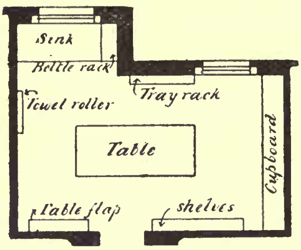
Cupboard with broom rack inside. See under clause No. 293 for the cupboard, which would only require one shelf at top; and under clause No. 288 for the broom rack.

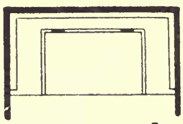
Shelves. See under clause No. 288.

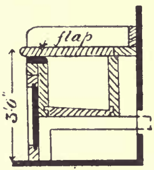
Butler's Pantry Sink and other Fittings.

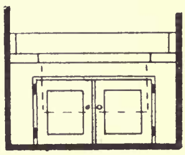
Butler's pantry sink (cased in).

(287)—To be fixed on 3 in. by 3 in. wrought framed deal dovetailed legs and bearers, pinned into wall, and formed with:—









$1\frac{1}{4}$ in. wrought deal, glued, dovetailed sink framing 2 ft. × 1 ft. 6 in. × 1 ft. 3 in. in the clear, with $1\frac{1}{2}$ in. dovetailed (or grooved and rebated) bottom sharply dished out to the centre outlet, with a $2\frac{1}{2}$ in. × $1\frac{1}{2}$ in. oak rounded nosing piece screwed on front edge, and the sink prepared for lead.

1 in. (or $1\frac{1}{4}$ in.) wrought deal, mortise and mitre clamped flap, hung on $2\frac{1}{2}$ in. brass butts in 1 in. (or $1\frac{1}{4}$ in.) wrought, beaded frame, rounded on front edge, with 5 in. × $\frac{3}{4}$ in. deal dovetailed square skirting on grounds with rounded ends.

Enclose sink with 1 in. wrought deal, one-panel square-framed doors, with rebated and beaded meeting styles, and hung folding on 3 in. brass butts in 1 in. beaded frame with fillet stops, and provided with a 3 in. brass neck bolt, a 2 in. brass turn-buckle on plate, and two $1\frac{1}{2}$ in. brass knobs.

The draining boards to be movable, and formed out of $1\frac{1}{2}$ in. fluted deal, with 2 in. × $\frac{1}{2}$ in. rounded oak raised fillet on three sides, and prepared for lead.

See clause No. 32 in Plumber for leadwork.

The tops of butler's sinks are fixed 3 ft. up from the floor.

In large establishments butlers require two sinks placed close together, one 2 ft. × 18 in. × 15 in. and one 18 in. × 18 in. × 15 in.

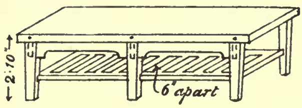
Butler's pantry sink (not cased in).

The description may be exactly similar to a housemaid's sink, see under clause No. 286 (and covered with lead), but without the oak flap, the sink being 2 ft. × 18 in. × 15 in. in the clear, and 3 ft. up from the floor. Or the sink may have a plain 1 in. (or $1\frac{1}{4}$ in.) wrought deal top (without lead covering) rounded on outer edge and round the sink opening, with a 1 in. (or $1\frac{1}{4}$ in.) rounded oak nosing piece screwed on front edge of sink, and a 5 in. × $\frac{3}{4}$ in. chamfered dovetailed skirting on grounds with rounded ends; and supplied with a movable fluted draining board, as previously mentioned under this clause.

For leadwork see Plumber, clause No. 32.

Towel roller. See under clause No. 288.

Table. Give size, such as 3 ft. 6 in. × 6 ft. to 8 ft. long, with the number of legs. The top may be in $1\frac{1}{2}$ in. to 2 in. deal. Describe similar to the table under clause No. 288, and instead of the stay rail at the feet describe a 2 in. × 2 in. skeleton-framed tray rack with bars spaced 6 in. apart.



If no drawers be required, the side framing would be similar to the end framing, but shaped out to give more room.

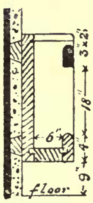
Table flap. If required, see under clause No. 288. State the size.

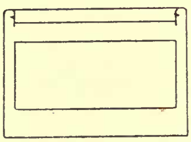
Bottle rack. See under clause No. 289.

Shelves. See under clause No. 288.

Tray rack. To be formed with $\frac{3}{4}$ in. wrought mahogany back, ends, bottom and front framing, rebated and grooved together, with rounded nosing at front edge, and beaded on back and end edges, and screwed to narrow double splayed deal grounds.

Put a 3 in. × $1\frac{1}{2}$ in. mahogany rail in front, rounded on top edge.



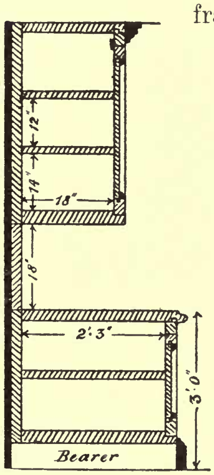


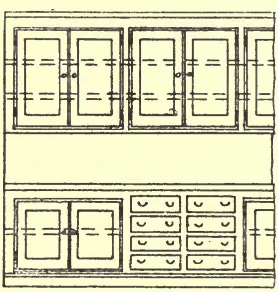
China cupboards. The upper range of cupboards to be in wrought framed deal 18 in. clear depth, and formed with:—

$1\frac{1}{4}$ in. beaded front framing, edges let into plaster, and 4 in. × $1\frac{1}{2}$ in. moulded cornice on top.

$1\frac{1}{4}$ in. one-panel square (or moulded and square) doors, hung folding against a fillet stop on 3 in. brass butts, with rebated and beaded meeting styles, and provided with one small brass cupboard lock, one 4 in. brass neck bolt, and two $1\frac{1}{4}$ in. brass handles to each pair of doors.

$1\frac{1}{4}$ in. (or $1\frac{1}{2}$ in.) rebated, beaded, grooved and cross-tongued bottom shelf.





Two 1 in. grooved and cross-tongued middle shelves.

1 in. grooved and cross-tongued solid divisions between each set of doors.

1 in. grooved, tongued, matched and beaded backs and sides from floor to ceiling, plugged to walls (or else fixed separately to backs of cupboards).

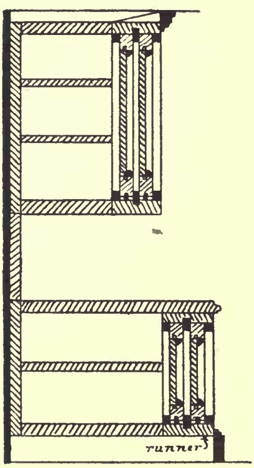
Put one row of $1\frac{1}{4}$ in. and 1 in. cup and jug hooks, spaced alternately every 6 in. and 4 in. apart, at the back of each tier of shelf divisions.

The lower ends of cupboards at either end of framing to be 2 ft. 3 in. clear depth, with similar cupboards, ironmongery, divisions and one shelf, but with no cup or jug hooks; and formed with:—

$1\frac{1}{4}$ in. rebated, beaded, grooved and cross-tongued bottom, on cross bearers spaced every 2 ft. 6 in. apart, with a $3\frac{1}{2}$ in. $\times$ 1 in. moulded skirting in front.

$1\frac{1}{4}$ in. (or $1\frac{1}{2}$ in.) grooved and cross-tongued top, moulded on front edge.

The centre part to be filled in with four tiers of drawers, having 1 in. twice beaded (or plain), solid divisions between each drawer. The drawers to be formed with 1 in. fronts, $\frac{3}{4}$ in. sides, backs and bottoms, dovetailed, ploughed and rebated together, and with oak (or deal) runner slides, and each drawer provided with two 3 in. brass drop drawer handles, and one small brass drawer lock.



If the top cupboard fronts be made with sliding doors, the description of the cupboard would remain the same, except the fronts, which would be described as:—

$1\frac{1}{4}$ in. square (or moulded and square) one-panel doors to slide on lignum vitæ blocks (or brass wheels) between $\frac{5}{8}$ in. $\times$ $\frac{1}{2}$ in. oak (or deal) beaded guide fillets nailed and housed to 4 in. $\times$ $1\frac{1}{4}$ in. framing, the bottom runner being in $1\frac{1}{4}$ in. wrought, grooved and beaded oak. Provide doors with small brass cupboard locks, 4 in. brass neck bolts, and a brass flush handle to each door.

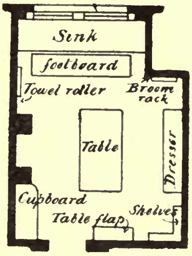
The bottom cupboards may either have hinged or sliding doors.

Scullery Sinks and other Fittings.

Lead-lined scullery sinks.

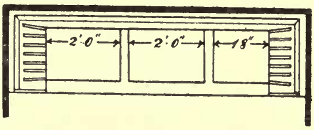
(288)—In large establishments three sinks are required, and may be described thus:—

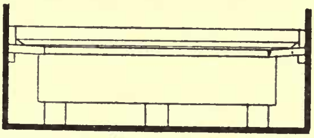
The three sinks to be 2 ft., 2 ft. and 18 in. long



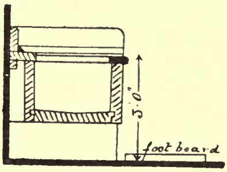
respectively, by 12 in. (to 14 in.) deep and 18 in. wide in the clear, prepared for lead, and formed with :—

$1\frac{1}{4}$ in. wrought deal, glued dovetailed framing in one piece, with two $1\frac{1}{4}$ in. centre divisions, $1\frac{1}{2}$ in. $\times$ $1\frac{1}{2}$ in. rounded oak nosing piece to front edge and centre divisions screwed on, $1\frac{1}{2}$ in. dovetailed (or grooved and rebated) bottom, sharply dished out to the centre outlets, and fixed on white enamelled bull-nosed brick bearers in cement.





$1\frac{1}{2}$ in. wrought fluted deal draining boards on wrought chamfered bearers, with $\frac{1}{2}$ in. $\times$ 2 in. raised rounded oak fillet on front edge, 7 in. $\times$ $\frac{3}{4}$ in. deal, dovetailed, chamfered skirting on grounds with rounded ends, and 1 in. $\times$ 1 in. angle fillets round three sides, and the whole prepared for lead.



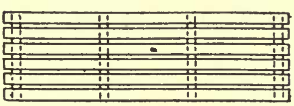
See clause No. 33 in Plumber for leadwork.

If the draining boards are not covered with lead, then they may be described as $1\frac{1}{4}$ in. fluted, hard wood draining boards on chamfered wrought deal bearers, with $\frac{3}{4}$ in. flutings stopped at top ends, and with a $2\frac{1}{2}$ in. $\times$ $\frac{5}{8}$ in. raised oak fillet on outer edge, and 7 in. $\times$ $\frac{3}{4}$ in. wrought deal, square, dovetailed skirting on grounds with rounded ends.

A single lead-lined scullery sink, which is all that is necessary in a small establishment, would be described in a similar manner, modified to the one sink.

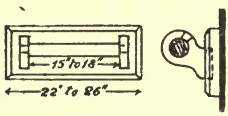
The tops of scullery sinks should be fixed 3 ft. up from the floor.

Foot board. Put on floor in front of scullery sinks a movable foot board 2 ft. wide, (say) 7 ft. long, formed with $2\frac{1}{2}$ in. $\times$ $1\frac{1}{2}$ in. wrought deal battens chamfered on edges, spaced $\frac{3}{4}$ in. apart, and screwed to 3 in. $\times$ 2 in. wrought deal, cut cross bearers every 2 ft. apart, the end bearers being placed 1 in. back from the ends of the battens.



The footboard is to prevent the scullery maids standing on a cold floor, and to keep them out of the wet.

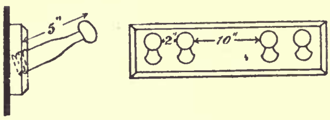
Towel roller. To be in wrought deal (or oak), with a 2 in. (or $2\frac{1}{2}$ in.) diameter pin, 15 in. (or 18 in.) clear length, let into $1\frac{1}{2}$ in. (or 2 in.) cut brackets, screwed and framed into a 7 in. × 22 in. (or 26 in.) × $1\frac{1}{4}$ in. (or $1\frac{1}{2}$ in.) thick, chamfered wrought back board screwed to plugs in the wall (and perhaps varnished).



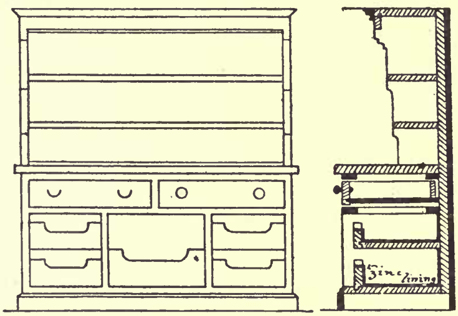
Cupboard See under clause No. 293. Only one shelf is required, as brooms may be placed in this cupboard.

Shelves Put along one wall (or more) an 11 in. × 1 in. wrought deal shelf with rounded corners, and edges slightly taken off, and screwed to cast-iron brackets every 4 ft. apart, screwed to plugs in the wall (and perhaps also to a 3 in. × $1\frac{1}{2}$ in. wrought chamfered bearer).

Broom-rack. The broom rack to be made to take two brooms, and formed with four $1\frac{1}{2}$ in. oak turned pins spaced 2 in. and 10 in. apart respectively, and screwed into an $1\frac{1}{2}$ in. × 7 in. × 33 in. wrought, chamfered back board screwed to plugs in the wall (and perhaps varnished).

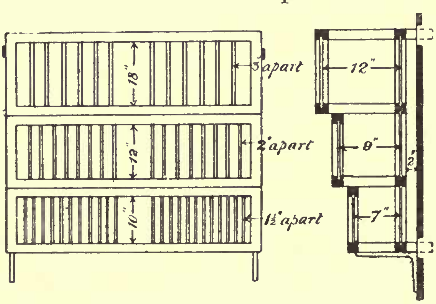


Dresser with vegetable bins. Describe in a somewhat similar manner to the dresser in clause No. 293, and in addition, state that the vegetable bins are to be formed with 1 in. wrought deal, grooved and tongued boarding, lined round on the sides, bottoms and edges with tin (or 14 gauge zinc), soldered together, and close copper-nailed on edges.



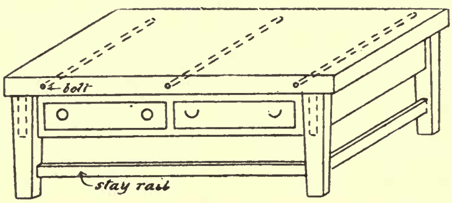
Vegetable bins are for placing vegetables in temporarily, for use as required. It is only in large establishments that they are generally required.

Plate rack Form plate rack in ash (or deal) in three tiers, about 5 ft. (3 or 4 ft.) long, with 2 in. × 2 in. wrought dovetailed framing with edges slightly taken off, and $\frac{5}{8}$ in. and $\frac{1}{2}$ in. diameter bar divisions, and secure the framing to wall with cast-iron brackets and strong holdfasts.

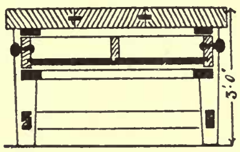


The plate rack should be over a sink.

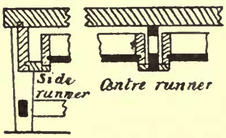
Working table. To be in wrought framed deal, with the arrises slightly taken off:—

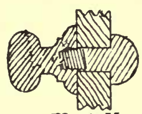


The table top to be 6 ft. × 4 ft., formed of 2 in. wrought, grooved and cross-tongued birch (elm or deal) rounded at corners, oak buttoned to framing, and bolted together with three ½ in. diameter wrought-iron bolts, with countersunk nuts and heads.



Section shewing drawers





Drawer Knob Handle

1½ in. (or 2 in.) × 4 in. skeleton deal framing round drawer fronts, housed into legs, 1½ in. skeleton-framed deal bearers (ledges) between drawers, with oak (or deal) runner slides.

1¼ in. (or 1½ in.) × 7 in. (or 9 in.) deal end framings, rebated to groove in table top and housed into legs, with oak (or deal) runner slides rebated to groove in end framings.

Four 4 in. × 4 in. (or 5 in. × 5 in.) deal tapered (or turned) legs, secured together at the feet with 3 in. × 2 in. wrought, rounded deal stay rails, housed into legs.

The two drawers to be 4 in. (to 6 in.) deep on face, the full width of table, pulling through from each side, and formed with 1 in. fronts, ¾ in. backs, sides, bottoms and centre divisions, dovetailed, ploughed, rebated and blocked together, with four (two each end) 2¼ in diameter oak (or deal) turned knobs to each drawer, secured with buttons on the inside (or four 4 in. brass drop handles).

The top of table to stand 3 ft. up from the floor.

The 3 in. × 2 in. stay rail at the feet is not always put. By making the drawers to run right through the table, they can the more easily be opened should they get fixed. State if drawer locks are required. Table legs should be placed about every 4 ft. apart. There is sufficient room for servants to take their meals when sitting both sides of a table 3 ft. 6 in. wide. When sitting only one side, 2 ft. 6 in. width will be ample; the height of the table in each case should not exceed 2 ft. 6 in. Kitchen tables in large establishments are required from 8 to 10 ft. long by about 4 to 5 ft. wide, and should stand 3 ft. up from the floor. In small establishments they may be 6 ft. × 3 ft.

Chopping block. Supply one 18 in. × 27 in. wrought birch chopping block, 2 in. (or 3 in.) thick, with edges slightly taken off, and with ⅜ in. × ¾ in. iron tongues let in at ends and screwed on with countersunk screws.

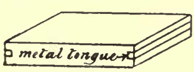
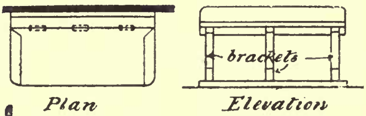
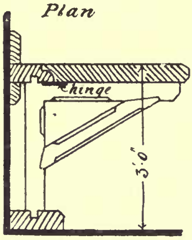


Table flap.

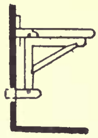
To be 2 ft. wide, 6 ft. long, in $1\frac{1}{4}$ in. (or $1\frac{1}{2}$ in.) wrought deal, grooved, cross-tongued, mortise and mitre clamped boarding, with edges slightly chamfered off, and rounded corners, and hinged on one and a half pairs 3 in. wrought-iron (or brass) butts to an $1\frac{1}{4}$ in. (or $1\frac{1}{2}$ in.) $\times$ $4\frac{1}{2}$ in. wrought fillet piece with knuckle joint, secured to a 3 in. $\times$ 2 in. wrought chamfered bearer plugged to wall, and with a $4\frac{1}{2}$ in. $\times$ $\frac{3}{4}$ in. chamfered skirting on top, rounded at ends.





Put two (or three) 3 in. $\times$ 2 in. wrought framed (and stop chamfered) angle brackets, to swing on centres between the fillet piece and a 4 in. $\times$ 2 in. chamfered foot piece, and supplied with 3 in. brass cabin hooks and eyes. The flap to be fixed 3 ft. up from the floor.

The angle brackets may be fixed at the feet into 9 in. $\times$ 3 in. $\times$ 3 in. wrought, chamfered deal blocks plugged into walls, instead of into the foot piece. Angle brackets are required about every 3 ft. apart.



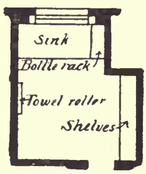
Another method of fixing the angle brackets is described in clause No. 305.

Dispenser's Sink and other Fittings.

Dispenser's sink.

(**289**)—See Plumber, clause No. 35.

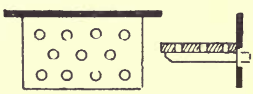
The description of the woodwork would be similar to a scullery sink, as in clause No. 288. It is generally made 2 ft. $\times$ 15 in. $\times$ 12 in. deep.



The top of a dispenser's sink should be fixed 3 ft. up from the floor.

Bottle rack.

To be in $1\frac{1}{4}$ in. (1 in. or $1\frac{1}{2}$ in.) wrought mahogany, with holes drilled for eleven (or other) bottles, and secured to wall with wrought chamfered mahogany bearers (or iron brackets) plugged into wall.



The bottle rack should be fixed over the sink.

Shelves.

See under clause No. 288; and Plumber, clause No. 35.

Towel roller.

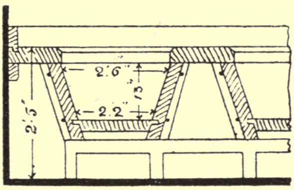
See under clause No. 288.

Draw-off sink on landing.

(**290**)—See Plumber, clause No. 34.

Washing Troughs and other Fittings.

Top to washing troughs.



(291)—To be a 2 in. wrought framed pine top, grooved for skirting, with chamfered openings for troughs and rounded on front edge, and fixed on wrought deal chamfered bearers. Put 6 in. × 1 in. wrought deal, rebated and dovetailed skirting on grounds with rounded ends.

For sizes of washing troughs in wood and other materials, see Plumber, clause No. 35A. They may be fixed 2 ft. 5 in. up from the floor.

Foot board. See under clause No. 288.

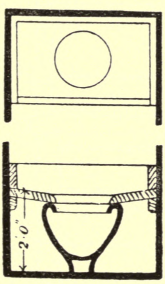
Towel roller. See under clause No. 288.

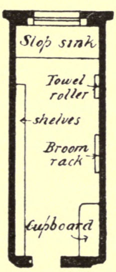
Shelves. See under clause No. 288.

Broom rack. See under clause No. 288.

Slop Sink and other Fittings.

Slop sink top.





(292)—Form slop sink top with $1\frac{1}{2}$ in. wrought deal, glued, tongued and grooved boarding, dished out to falls to the centre, with a 2 in. × $\frac{5}{8}$ in. raised oak beading on front edge. Cut hole for sink thumb moulded on edge, and fix top on wrought deal chamfered bearers ; put 7 in. × $\frac{3}{4}$ in. chamfered dovetailed deal skirting on grounds with rounded ends, and 1 in. × 1 in. angle fillet piece, and prepare for lead.

For leadwork, see Plumber, clause No. 55.
A slop sink top should be fixed 2 ft. up from the floor.

Shelves. See under clause No. 288.

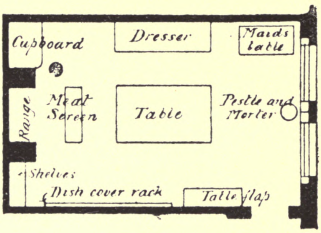
Towel roller. See under clause No. 288.

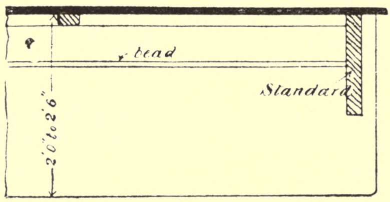
Broom rack. See under clause No. 288.

Cupboard. See under clause No. 293. Only one shelf is required, as brooms are placed below.

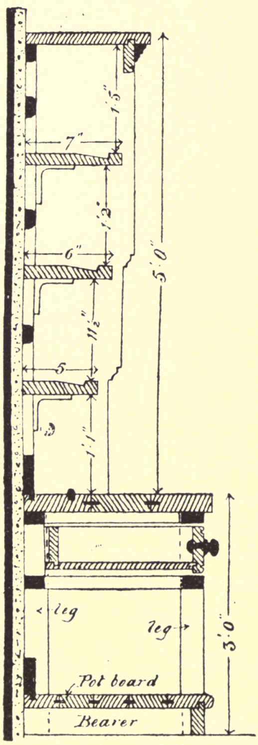
KITCHEN FITTINGS.

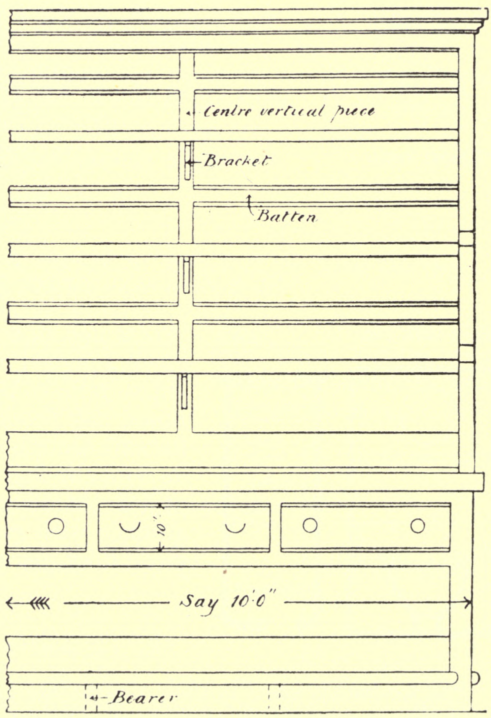
Dresser (with plastered wall at back). **(293)**—To be in wrought yellow deal, about 10 ft. long by 8 ft. high, framed and glued together, and secured to plugs in the wall.

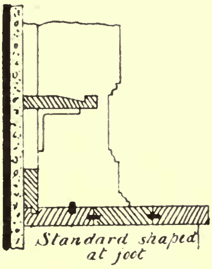




Plan







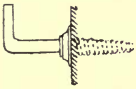
Form top 2 ft. (2 ft. 3 in. or 2 ft. 6 in.) wide, 2 in. thick, in clean white deal, grooved and cross-tongued together, with the edges slightly chamfered off, rounded at corners, grooved for the standards, skirting and beading, and with an 1 in. × $\frac{3}{4}$ in. plate bead housed in along top.

$1\frac{1}{4}$ in. (or $1\frac{1}{2}$ in.) cut and shaped standards grooved for shelves and housed into dresser top. (State if standards are shaped at feet, see sketch.)

1 in. × $2\frac{1}{2}$ in. centre vertical piece, rebated into dresser top, with galvanised iron brackets (weight about 1 lb. each) screwed on to receive the shelves.

3 in. × 1 in. battens chamfered (or beaded) on edges, housed into standards and halved on to the centre vertical piece.

7 in. × 1 in. chamfered skirting rebated to dresser top.



1 in. (or $1\frac{1}{4}$ in.) shelves, 5 in., 6 in. and 7 in. wide respectively, sunk for plates and dishes and housed into end standards, the middle shelf being provided with $1\frac{1}{4}$ in. brass hooks with screw shanks every 6 in. apart, and the top and bottom shelves with 1 in. hooks every 4 in. apart.

4 in. × 1 in. fascia let in flush with edges of standards, beaded on edge and rebated to groove in top, with a 3 in. × $1\frac{1}{2}$ in. cornice moulding returned round the standards. The top board to be $\frac{3}{4}$ in. (or 1 in.) and well secured to a chamfered fillet at back.

Four 3 in. × 3 in. (or 4 in. × 4 in.) legs, $2\frac{1}{2}$ in. × 2 in. rail over drawers, 3 in. × 2 in. rail under drawers, $1\frac{1}{4}$ in. skeleton-framed divisions between drawers, with oak (or deal) runner slides, 3 in. × 2 in. skeleton framing at back, $1\frac{1}{4}$ in. end pieces (panels) housed into legs, with oak (or deal) runner slides grooved and rebated on.

$1\frac{1}{4}$ in. grooved and tongued pot board, rounded nosing to front and ends, grooved for skirting and riser, and fixed on $2\frac{3}{4}$ in. × 2 in. cross bearers every 2 ft. 6 in. apart; $2\frac{3}{4}$ in. × $1\frac{1}{2}$ in. riser, and 4 in. × 1 in. skirting, both rebated to pot board.

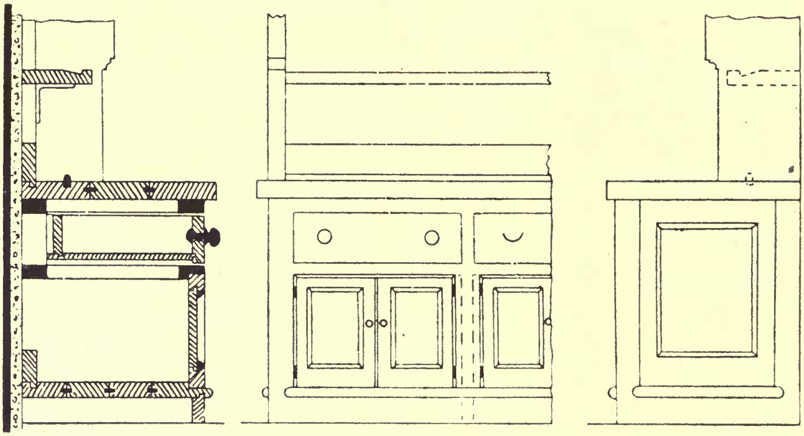
The drawers to be 9 in. (or 10 in.) deep on face, with 1 in. fronts beaded (or not) on top and bottom edges, $\frac{3}{4}$ in. backs, sides and bottoms, dovetailed, ploughed, rebated and blocked together, and each drawer supplied with two $2\frac{1}{2}$ in. oak (or deal) turned knobs secured with buttons on the inside (or with two 4 in. brass drop handles), and one small brass drawer lock.

The dresser top is to be left unpainted (or unvarnished).

If the dresser be boarded at the back with 1 in. wrought, matched and beaded boarding, the shelves will not require the iron brackets for support, neither will the centre vertical piece on which to screw the brackets be required, nor will the battens or the skirtings to the dresser top and pot board be absolutely necessary; the skeleton framing at the back of the drawers and the fillet under the top board may also be dispensed with.

In large establishments two dressers are sometimes required in a kitchen, one being similar to that just described, and the other being also similar, except that the space under the drawers is formed into cupboards either with hinged or sliding doors.

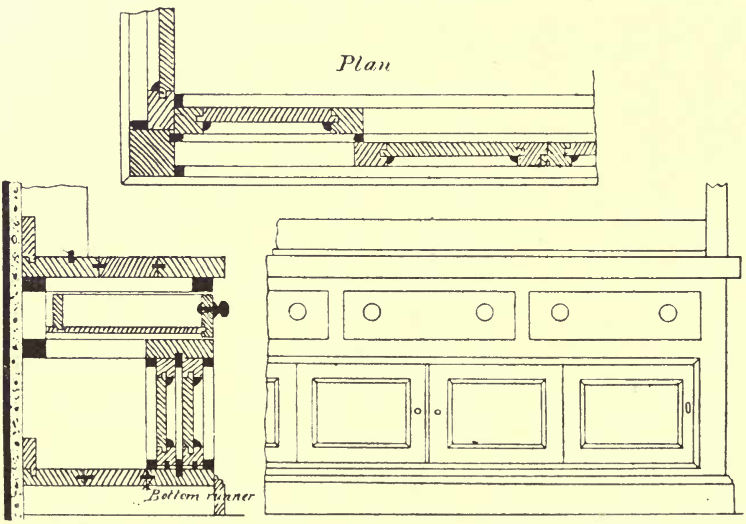
If enclosed with hinged doors the description may run :—



$1\frac{1}{4}$ in. square (or moulded and square) one-panelled doors with rebated and beaded meeting styles, and hung on $2\frac{1}{2}$ in. brass butts in $1\frac{1}{4}$ in. beaded frame, with 1 in. solid division between each set of doors. Provide doors with small brass cupboard locks, 4 in. brass neck bolts, and one $1\frac{1}{4}$ in. brass handle to each door.

The pot board to be rebated out, and the rail under drawers beaded and rebated to receive doors. Fill in the end panels with similar framing rebated in.

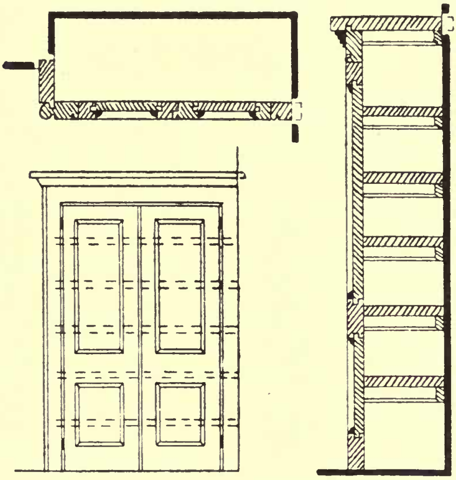
If enclosed with sliding doors, the description may run :—



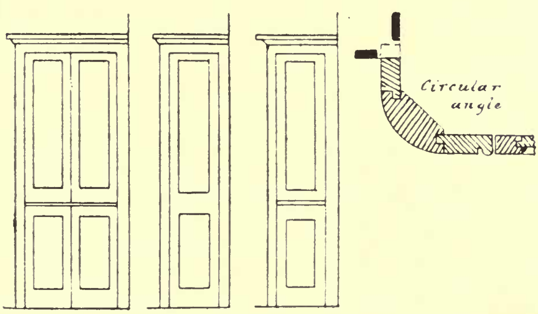
$1\frac{1}{4}$ in. square (or moulded and square) one-panel doors, to slide on lignum vitæ blocks (or brass wheels) between $\frac{5}{8}$ in. $\times$ $\frac{1}{2}$ in. oak (or deal) bead guide fillets, nailed and housed to the framing; the bottom runner being in 1 in. (or $1\frac{1}{4}$ in.) wrought grooved oak. Supply doors with small brass cupboard locks, 4 in. brass neck bolts, and a 3 in. brass flush handle to each door. Fill in the end panels with similar framing rebated in.

The rail under the drawers would have to be 4 in. wide to take the guide fillets, and instead of the pot board having a rounded nosing, a small moulded or chamfered skirting might be run round.

Cupboard. Form cupboard (say) 8 ft. high, 11 in. (or 14 in.) clear depth, with $1\frac{1}{4}$ in. (or $1\frac{1}{2}$ in.) wrought deal, grooved, rebated and beaded framing, rebated at top, staff beaded at angle, and edges let into plastering. Hang folding $1\frac{1}{4}$ in. (or $1\frac{1}{2}$ in.) two-panel, square (or moulded and square) doors with rebated and beaded meeting styles, on $3\frac{1}{2}$ in. brass (or wrought-iron) butts, and provide with a 3 in. brass cupboard lock, two $1\frac{1}{4}$ in. brass handles, and two 4 in. brass neck bolts. The top to be 1 in. (or $1\frac{1}{4}$ in.) grooved, cross-tongued wrought deal, chamfered on front edges with a small moulding under, and fixed to wrought chamfered deal bearers, and the back edge of top let into the plaster. Put five tiers of 1 in. (or $1\frac{1}{4}$ in.) wrought deal shelves 11 in. (or 14 in.) wide on wrought deal chamfered bearers.



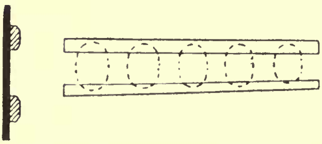
If the cupboard stands back entirely in a recess, the staff bead will not be necessary, all the edges being let into the plastering. If the back and sides be boarded, describe it as 1 in. wrought, grooved and tongued, matched and beaded boarding secured to plugs in the walls.



If the cupboard be very high, four one-panel doors will be necessary, with a beaded horizontal joint. If the cupboard be narrow in width, either one two-panel, or two one-panel doors will be required, according to the heights.

State if cupboard has a circular angle worked out of the solid, and to what external radius, see sketch on page 285.

Dish-cover rack. Put two 1 in. × $4\frac{1}{2}$ in. chamfered (or moulded) on all edges wrought deal dish-cover rails 10 ft. long, secured to plugs in wall, and provided with brass hooks with screw shanks, spaced apart as required. (State if varnished.)



Shelves. See under clause No. 288.

Working table. Similar to that under clause No. 288.

Chopping block. See under clause No. 288.

Maids' table. Sometimes an extra table about 2 ft. 6 in. × 4 ft. 6 in. is provided in the kitchen, at which the kitchen maids may take their meals. No drawers would necessarily be required. The height should be 2 ft. 6 in. from the floor.

The top might be in $1\frac{1}{4}$ in. (or $1\frac{1}{2}$ in.) grooved and cross-tongued wrought white deal (or moulded on edge), with rounded corners, $2\frac{1}{2}$ in. × $2\frac{1}{2}$ in. tapered (or turned) legs, with 5 in. × $1\frac{1}{4}$ in. framing between, rebated and housed in, and the whole grooved and blocked together.

If the table have a flap, a knuckle-joint would be required at the edge, with $1\frac{1}{4}$ in. oak hinged brackets screwed to the framing. See notes referring to tables under clause No. 288.

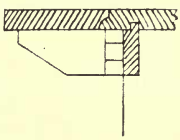
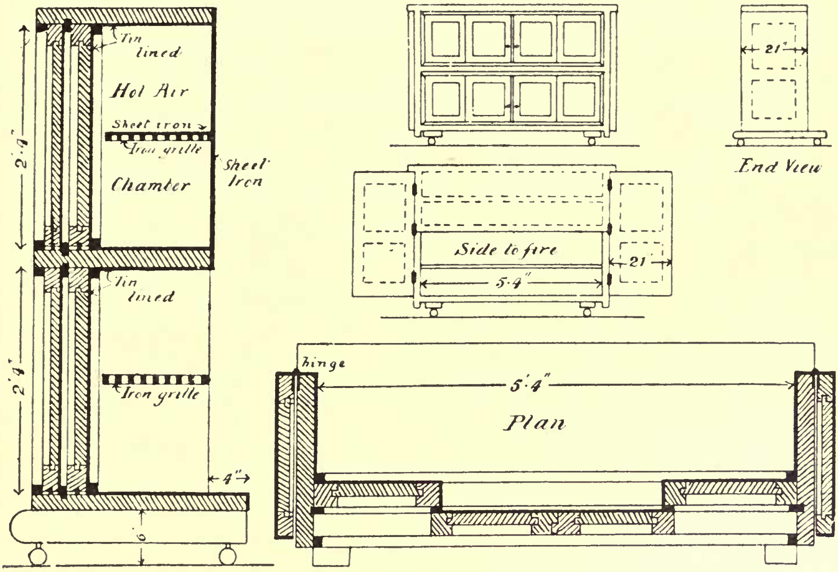


Table flap. See under clause No. 288.

Meat screen. Form meat screen in wrought deal, with the arrises slightly taken off, fox dovetailed, and framed together with $1\frac{1}{2}$ in. top, ends, middle division and bottom, and resting on two 4 in. × 3 in. deal bearers rounded at ends and fixed on four strong casters. Provide the ends with 4 in. brass drop handles.

$1\frac{1}{2}$ in. bead flush one-panel back framing, with sliding doors in central portion, rebated and beaded together at meeting styles, sliding on lignum vitæ blocks (or small brass wheels) between grooves formed with beaded fillets nailed and housed in. Each door to be provided with $1\frac{1}{2}$ in. brass rose handle.

Put two $\frac{3}{4}$ in. wrought (or cast) iron grille racks, covered (or not) with sheet iron.



The upper half of screen to be covered with sheet iron on the face towards the fire, the lower half being left open.

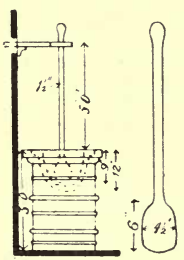
Form each of the two wings (side screens) in $1\frac{1}{2}$ in. bead flush two-panel framing, hung on $1\frac{1}{2}$ pair of 3 in. brass (or wrought-iron) butts, and provided with small brass cabin hooks and eyes.

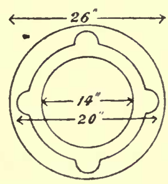
Line the whole of the inside of screen and the one side and edges of side wings with block tin.

Paint the whole of the outer faces four times in oil, comb grain as wainscot, and twice varnish.

The centre division may be placed higher up, giving three spaces below, with only the one chamber above; the doors would then be in unequal heights.

Pestle and mortar. The mortar to be cut out of a block of solid white marble, 9 in. deep by 14 in. diameter internally, 12 in. deep by 20 in. diameter externally, and fixed into an elm turned and moulded block 2 ft. 2 in. diameter, 3 ft. high, rimmed round with three bands of $1\frac{1}{2}$ in. $\times \frac{3}{16}$ in. wrought iron.





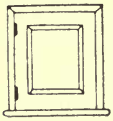
The pestle to have a 6 in. $\times 4\frac{1}{2}$ in. rounded boxwood rammer (lignum vitæ or marble), with $1\frac{1}{2}$ in. diameter ash handle 5 ft. long, working in a cast-iron eye bracket pinned into wall.

State if the elm block is plain turned, without mouldings; or if octagon-shaped, and if tapered.

Cook's hand lavatory.

See Plumber, under clause No. 36.

Serving-hatch.

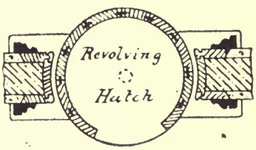


(**294**)—If a serving-hatch be placed opening direct into the dining room, the hatch-door linings and finishings should match the dining-room doors, see clause No. 244, with the addition of a rebated window board similar to the windows. The hatch door may be 18 in. to 2 ft. wide by 18 in. to 2 ft. high; the window board being placed about 3 ft. from the floor.

The door might be $1\frac{1}{2}$ in. (or $1\frac{3}{4}$ in.) thick, hinged on 3 in. wrought-iron (or brass) butts, and secured with two 6 in. brass bolts (or two 6 in. brass cabin hooks and eyes).

A serving flap should be provided on the lobby side similar to that under clause No. 288, about 3 ft. (or 4 ft.) long by 2 ft. wide.

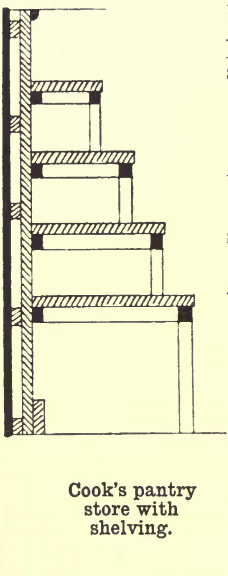
The hatch may be worked as a sliding shutter similar to clause No. 156; or a revolving hatch may be described to work on centres.



If the hatch be between the kitchen and the serving-room, the door and lining would be quite plain, as to doors in clause No. 241.

China store with shelving.

(**295**)—Line round walls with $\frac{3}{4}$ in. (or 1 in.) wrought deal, grooved and tongued, matched and beaded boarding, on $2\frac{1}{2}$ in. × $\frac{3}{4}$ in. battens 2 ft. 6 in. apart, plugged to walls, with 7 in. × 1 in. plain deal skirting, and an 1 in. staff bead as a finish against ceiling.

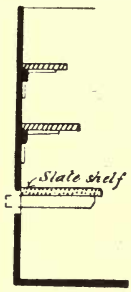


Fit up on three sides four tiers of 1 in. (or $1\frac{1}{4}$ in.) wrought deal cross-tongued shelving 21 in., 18 in., 15 in. and 12 in. wide respectively, with the front edges slightly taken off, and fixed to 3 in. × 2 in. wrought deal dovetailed rails and bearers, with standards every 4 ft. apart, the bearers and rails being slightly chamfered off at edges Fix brass cup hooks with screw shanks every 4 in. apart to the two middle shelves, and $1\frac{1}{4}$ in. brass jug-hooks every 6 in. apart round two tiers at the back.

Cook's pantry store with shelving.

(**296**)—The shelves may be described similar to clause No. 295. The matchboarding at back may be omitted. No hooks would be required, as dry goods only are stored in this pantry.

Butter, milk and pastry larder.



(297)—If slate shelves be required see Slater, clause No. 16. When the upper shelves are in deal describe as:—

The two upper tiers of shelves to be 1 in. (or $1\frac{1}{4}$ in.) wrought deal cross-tongued boarding 18 in. and 15 in. wide respectively, with edges slightly taken off, and fixed on 3 in. × $1\frac{1}{2}$ in. wrought deal chamfered bearers, plugged to walls, and with cast-iron brackets placed every 4 ft. apart screwed to plugs in walls.

Cover the window outside with 16-gauge perforated zinc, copper nailed.

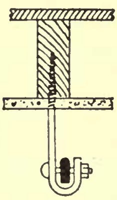
For a large refrigerator or "cold store" see clause No. 335.

Larders should face the north or east; if facing the west or south a louvred window should be provided, see clause No. 153.

As pastry is frequently made in this larder, a portion of the lower shelf should be made sufficiently large for this purpose, say about 2 ft. wide by 3 ft. 6 in. long, with the corners rounded off. Or a movable polished 1 in. (or $1\frac{1}{4}$ in.) Sicilian marble slab, with rounded edges, may be provided about the same size.

When meat and game are hung in this larder, see clause No. 298 for the extra fittings.

Meat and game larder.



(298)—Fit up two 2 in. × $\frac{3}{8}$ in. galvanised wrought-iron meat rails, secured to ceiling with galvanised wrought-iron hangers 4 ft. apart, screwed into joists, and provide one dozen tinned meat hooks.

Cover the window outside with 16-gauge perforated zinc, copper nailed. (Also see clause No. 153 for outside louvres.)

For a large refrigerator or "cold store," see clause No. 335.

Fixed tinned meat hooks, screwed to the joists, may be provided instead of the meat rails and loose meat hooks. In a larder where meat and game only are hung, shelves are not always required.

Servants' Hall Fittings.

Table.

(299)—May be similar to that mentioned under clause No. 293, or as in clause No. 288.

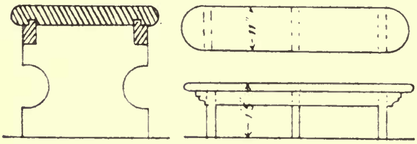
Cupboard for servants' china.

Would be similar to a kitchen cupboard, see under clause No. 293, with the addition of cup and jug hooks as mentioned in clause No. 295.

Table flap.

See under clause No. 288.

Benches. Provide two wrought deal framed benches, each 12 in. longer than longest side of table, and formed with :—



11 in. $\times 1\frac{1}{4}$ in. (or $1\frac{1}{2}$ in.) seats rounded at nosings and ends, with $1\frac{1}{4}$ in. $\times 4\frac{1}{2}$ in. cut horizontal rails under, rebated to seat and notched to standards.

$1\frac{1}{2}$ in. cut standards every 3 ft. 6 in. apart.

Fruit store. (**300**)—Put $1\frac{1}{2}$ in. grooved and cross-tongued wrought deal fruit bench, 2 ft. wide, chamfered on edges, and fixed 3 ft. high up from floor, on 4 in. $\times$ 4 in. wrought framed bearers, and 4 in. $\times$ 4 in. tapered legs. Then describe the shelving 15 in. wide, similar to that under clause No. 288.

Wine cellar. (**301**)—Put $1\frac{1}{2}$ in. wrought deal, grooved and tongued, mortise and mitre clamped decanting bench, about 2 ft. $\times$ 5 ft., placed 2 ft. 6 in. from floor, chamfered on edges, and secured to 4 in. $\times$ 3 in. wrought deal framed bearers and 4 in. $\times$ 4 in. tapered legs.

See Slater, clause No. 15, for slate shelves and wine bins.

Beer cellar. (**302**)—Provide one (or more) wrought strong framed beer-horse.

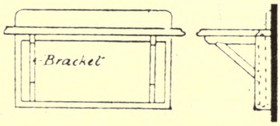
Lamp and boot room. (**303**)—The boot bench to be in 2 in. wrought birch (or elm) 21 in. wide, 3 ft. long, with rounded corners, placed 2 ft. 10 in. high, and secured to 4 in. $\times$ 4 in. wrought deal bearers, and 4 in. $\times$ 4 in. tapered legs. The lamp bench to be an $1\frac{1}{2}$ in. wrought deal, grooved and cross-tongued shelf 2 ft. 3 in. wide, placed 2 ft. 10 in. high, with bearers and standards. Fix under lamp bench two drawers each 18 in. wide, 6 in. deep on face, formed with 1 in. fronts, $\frac{3}{4}$ in. backs, sides and bottoms, dovetailed, housed and rebated together, with oak (or deal) runners and side bearers. Put one $1\frac{1}{4}$ in. shelf over lamp bench 18 in. wide, secured to brackets, plugged to walls.

If any cupboards are required in this room under the lamp benches describe them somewhat similar to those under clause No. 287 modified.

Footman's flap for brushing clothes. (**304**)—Similar to the flap under clause No. 288. It should be fixed about 2 ft. up from the floor, and be about 7 ft. long.

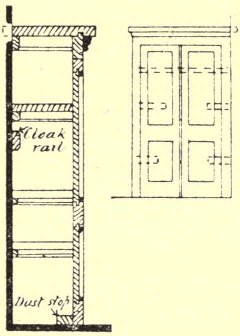
Serving flap in hall.

(305)—The flap itself would be similar to that under clause No. 288, about 2 ft. × 3 ft. 6 in., but in oak or mahogany, French polished and moulded on edges. The angle brackets to a flap in this position generally swing between a $2\frac{1}{2}$ in. × 1 in. framing, instead of the foot piece as mentioned in clause No. 288.



Bedroom cupboards.

(306)—Each of the first and second floor bedrooms to have cupboards (say) 7 ft. 6 in. high, 18 in. clear depth.

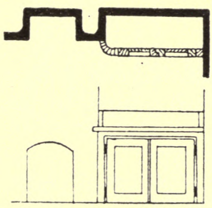


Then describe similar to a kitchen cupboard under clause No. 293, but only one hat or bonnet shelf is necessary, with perhaps, small side shelves for boots, and in addition describe a $5\frac{1}{2}$ in. × $1\frac{1}{4}$ in. (or $1\frac{1}{2}$ in.) chamfered (or moulded) all round, wrought deal cloak rail plugged to walls and provided with brass or japanned malleable cast-iron (or wrought-iron) cloak hooks every 9 in. apart. Put a 2 in. × $1\frac{1}{2}$ in. dust stop at foot of doors.

Bedroom cupboards must not be too shallow, otherwise the hanging dresses will be crushed.

Dwarf cupboards.

(307)—Describe similar to a kitchen cupboard as under clause No. 293, and take a $4\frac{1}{2}$ in. × $\frac{3}{4}$ in. square dovetailed skirting on top, with rounded corners, fixed to narrow splayed grounds.



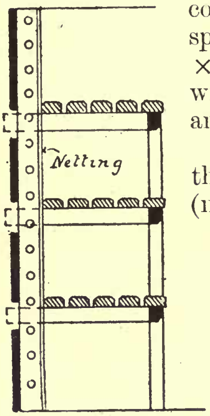
Only one or two shelves would be necessary.

Dwarf cupboards are now seldom put in living rooms, unless it be to cheap property. The top and skirting may be in mahogany, French polished, and rounded (or moulded) on edge.

Other cupboards.

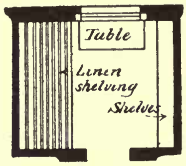
(308)—Cupboards in other positions might be described similar to those in clauses Nos. 293, 287, or 306, according to the requirements of the case.

Linen closet.



(309)—Fit up three tiers of shelving each 2 ft. wide, composed of 3 in. × 2 in. wrought deal battens (laths) spaced $\frac{3}{4}$ in. apart, chamfered on edges, and fixed to 3 in. × 2 in. wrought deal dovetailed rails and bearers and with standards placed every 4 ft. apart, the bearers and rails being chamfered on edges.

The linen to be protected from the heating pipes at the back with an $\frac{1}{8}$ in. galvanised iron wire shield (netting).



The walls may be lined with boarding, see clause No. 295.

Linen closets should always be heated either by special heating pipes, as in clause No. 106, under Smith, or else by placing if possible the circulating cistern of the hot water apparatus in this closet on the floor level. The open laths will allow the heat to ascend through the various tiers of shelving.

When linen closets are formed into cupboards, the fronts may be described similar to those under clause No. 287, either as hinged or sliding.

Table.

A table is required for folding the linen, and may be similar to a maid's table, see under clause No. 293. State the size.

Shelves.

Similar as under clause No. 288.

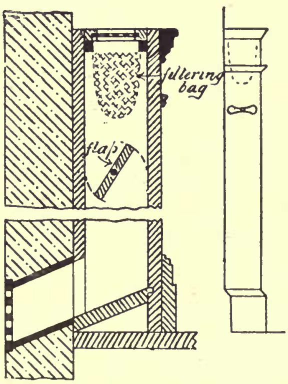
Bell-board.

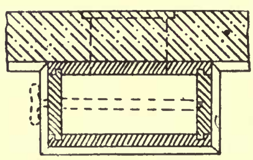
(310)—See Bell Hanger, clause No. 2.

(311)—

"Tobin's" tube air inlets.

(312)—Form "Tobin's" tube air inlets, each 8 in. × 4 in. in the clear and 5 ft. (4 or 6 ft.) high to the





following positions mentioned below, with 1 in. wrought both sides, grooved and rebated deal box framing, $2\frac{1}{2}$ in. × 2 in. moulded capping, a small necking moulding, and skirting to match the various rooms.

Put a canvas filtering bag filled with cotton-wool in each tube, with a perforated wire gauze in movable frame at top, and a regulating flap with brass handle below. (For outside gratings, see Bricklayer, clause No. 57.)

Here are the positions of the tubes:—

Four positions each in dining room, breakfast room, billiard room and kitchen.

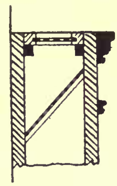
Two positions in each other ground floor room.

Two positions in each first floor bedroom.

One position in each second and third floor bedroom, bathroom and w.c.'s. State any other positions.

The wire gauze frame is to prevent articles falling down the tubes.

If the tubes be somewhat wide, state that the framing is in moulded panels. The angles may be finished with a staff bead. If there be a dado, the tubes should follow somewhat the same design.

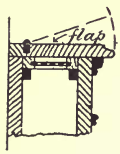


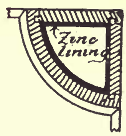
Sheet gauze may also be used as a filtering medium instead of the cotton-wool bag.

The tubes may be lined with thin sheet zinc, say No. 12 gauge, soldered at angles. An 1 in. (or 1½ in.) rounded (or moulded) deal flap hinged on 2 in. brass butts may be placed on the top of the tube in lieu of the flap and brass handle.

State if tubes are quadrant shaped.

See notes on "Ventilation" for sizes of inlet tubes.

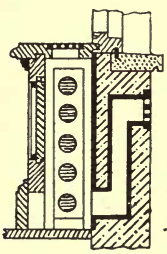


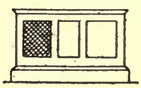


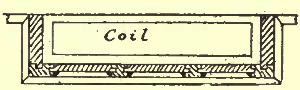
Coil casing.

(313)—When heating coils are placed behind the window backs, the framing may be described as:—

1¼ in. (or 1½ in.) wrought deal, moulded and square three (or more) panel grooved and rebated framing, staff beaded at angles, rebated to window board with a small moulding under, and the room skirting following round. The whole to be made movable for access to coils, with brass flush bolts.







Perforate the window board, and fix a fine cast-iron (or brass) ½ in. grating, rebated and screwed in. (For outside grating as air inlets to coils, see Bricklayer, clause No. 57.)

The panels to the window back may be filled in with perforated gratings.

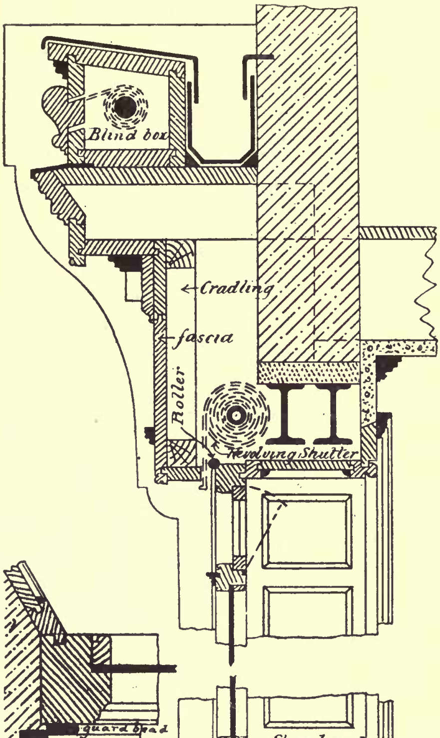
See Smith, under clause No. 106, for iron coil cases.

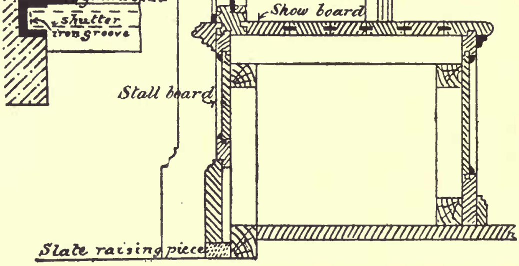
Index board.

(314)—In large offices an index or address board is often required, giving the names of the various firms situated in the building. It may be in plain deal painted, or in oak or mahogany French polished, and either with or without glass fronts. Allow a p.c. sum, or describe the parts fully.

SHOP FRONT AND SHUTTERS.

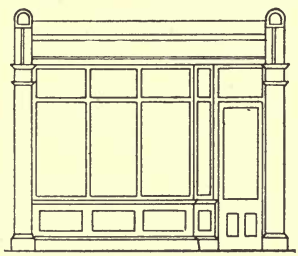
(Clauses Nos. 315 to 317.)

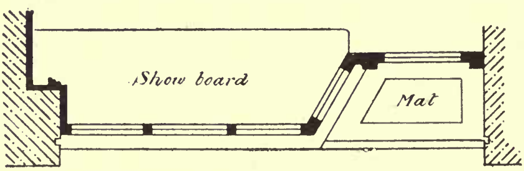


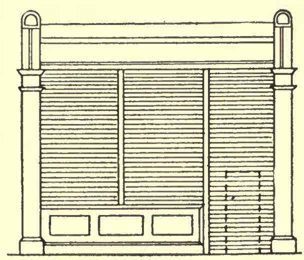


Shop front framing. (**315**)—Form the stall-board with 2 in. moulded (or solid moulded) and square one panel high rebated wrought deal framing six or other panels long, tongued and mitred at angle, with 4 in. × 3 in. rebated and moulded capping (nosing), and $1\frac{1}{4}$ in. × 9 in. moulded skirting on backings, kept $\frac{3}{4}$ in. above paving, with a $\frac{3}{4}$ in. × 3 in. rubbed slate raising piece.

Form the show-board framing with 4 in. × 4 in. heads, sills and end posts, 4 in. × $2\frac{1}{2}$ in. quarters every 2 ft. 6 in. apart, 4 in. × 3 in. braces and 4 in. × $2\frac{1}{2}$ in. joists every 12 in. apart, and lay 1 in. wrought deal, rebated, grooved and iron-tongued flooring over with grooved and rounded nosing on front edge, and a small moulding under, $1\frac{1}{2}$ in. moulded and square, one panel high, rebated riser four (or







other) panels long, with 7 in. × 1 in. moulded skirting. Form in riser, in beaded frames, two similar framed doors for access under show-board, and hang on 3 in. iron (or brass) butts, and provide each door with an $1\frac{1}{4}$ in. brass rose handle with turnbuckle on plate.

The window framing to be in wrought Honduras mahogany (or deal), prepared for plate glass, with 1 in. × $\frac{1}{2}$ in. loose beads and brass cups and screws and French polished, and having:—

4 in. × 3 in. rebated and beaded (or moulded) frame grooved for linings.

4 in. × 3 in. twice rebated, twice beaded (or twice moulded) transome and mullions, with transome grooved for a small moulding rebated on.

4 in. × 3 in. rebated, beaded (or moulded), twice grooved and weathered sill.

Run round framing an 1 in. × $\frac{1}{2}$ in. (or $1\frac{1}{2}$ in. × $\frac{3}{4}$ in.) guard bead. (A guard bead is not absolutely required when a good joint can be made between the shop sash frame and the adjoining work.)

Glaze windows with $\frac{1}{4}$ in. British polished plate glass bedded in putty and wash-leather.

Fill in fanlights with $1\frac{1}{2}$ in. (or 2 in.) moulded sashes with loose beads and brass cups and screws, and glazed with similar plate (or other) glass, and hung on 3 in. brass butts, and provided with brass quadrant stays and brass spring catches.

For glass see also Glazier, clause No. 11.

For movable iron grille to shop front and movable grille gates to lobby, see Smith, clauses Nos. 59 and 60 respectively. These grille protections are usually put when no shop shutters are provided.

For shop doors see clauses Nos. 261 and 262.

Lobby soffit. The lobby soffit to be $1\frac{1}{2}$ in. (or 2 in.) moulded and square panelled framing, with a small moulding round as cornice.

The soffit is sometimes lined with $\frac{3}{8}$ in. silvered plate glass in a French polished mahogany frame, with loose beads and brass cups and screws.

The lobby paving might be laid as in Pavior, clauses Nos. 2 or 3, and in addition describe a 3 in. × 2 in. rubbed slate nosing-piece with the arris taken off and screwed down with brass or gun-metal screws every 12 in. apart.

Linings. Then describe the soffit and elbow linings and architrave in deal, similar to clauses Nos. 145 or 146.

Entablature. 1 in. (or $1\frac{1}{4}$ in.) wrought Honduras mahogany, tongued (or rebated) and grooved, beaded (or moulded) fascia, fixed loose with brass cups and screws for access to shutter gearing, and secured to deal cradling formed with 4 in. × 3 in. head, sill, end posts, braces and intermediate posts placed every 2 ft. 6 in. apart, secured together with $\frac{1}{2}$ in. (or $\frac{3}{8}$ in.) wrought-iron bolts, heads, nuts and washers (also see clause No. 45). Print fascia in gold Roman letters 9 in. (or other size) deep (give the name of firm).

The fascia should always be in mahogany, being deep, it will not be so liable to twist or split as if in deal.

In streets up to 30 ft. wide, the London Building Act allows any part of a shop front to project 5 in. beyond the main building line, so long as it does not encroach upon the public way, but the cornice may project 13 in. and overhang the public way. In streets over 30 ft. wide, the shop front in like manner may project 10 in. and the cornice 18 in.

The necking, cornice mouldings, soffit, dentils and top to be in deal, grooved and rebated together, with brackets, backings, bearers and stiffeners in wood and iron, so as to make the cornice a firm piece of framed work.

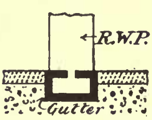
Blind box and blind.

$1\frac{1}{4}$ in. wrought deal, weathered, grooved, rebated sun-blind box framing, with small moulding on top edge, and opening formed in front face for blind.

The sun-blind to be of best striped linen tick sun-blind material, to fall out the full length of shop front in two (one or more) widths, with moulded yellow pine blind board (front), spring rollers, gear, wrought galvanised iron blind arm rods and standards, and provided with a 6 ft. long arm, with brass (or steel) hook. Put a lap spring roller, with blind strip to cover the joint between the two widths of blinds, and with side blind pieces at the ends.

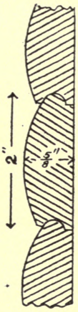
The sun-blind may be fixed under the entablature if so desired.

Leadwork and R.W.P.



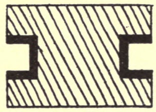
Cover top of cornice and blind box, and form gutter at back with 5 lb. lead, copper-nailed 1 in. apart, with 5 lb. lead flashing wedged and pointed up in cement. Take 3 in. rain-water pipe, with copper rose at outgo, down to pavement, and continue on to street gutter with a cast-iron pavement surface gutter, level with the pavement, or else carry down to a drain gulley.

Revolving shutters with wicket.



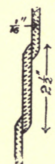
The shutters to be convex pine wood lath, self-acting, revolving shutters, connected together with superfine straining webbing and hardened steel (or copper) bands, to fall in three (one or two) widths down iron grooves, on steel spiral springs and gear in iron (or tin) barrel cases, firmly secured behind the fascia (or under the bressummer) with brackets, fastenings and guide rollers. Provide two movable wrought deal pilasters $4\frac{1}{2}$ in. wide with iron grooves, iron heads, stub shoes and plates, and provide one 6 ft. long-arm with brass (or steel) hook. Form hinged wicket door in lobby portion of shutter, with lock and fastenings. The shuttering to be painted one coat in oil-colour before leaving the maker's, and three coats afterwards where towards the weather.

Here is a detail of a movable pilaster.

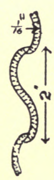


State if the wicket door is to be provided in addition with an iron grille door with hinges and fastenings. It is sometimes required for ventilation in butchers' and similar trades.

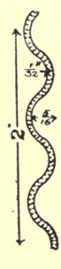
Also mention if the upper part of shutter is to be partly open for ventilation.



Revolving shutters are also made in flat iron laths.
" " " steel laths.



" " " curvilinear iron laths.
" " " " steel laths.



" " " corrugated steel.

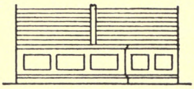
When made in these materials, they should not be in greater single widths than 6 ft.

The wood laths may be iron hinged for greater strength.

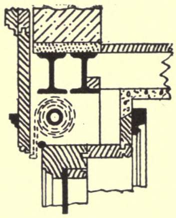
Pine wood laths may be only varnished; and in various other woods, such as oak and mahogany, either varnished or French polished.

There are various makers of revolving shutters.

If the revolving shutters to the lobby space do not come down to the ground, a movable piece of stall-board framing must be described to the lobby, and provided with fixing bolts.



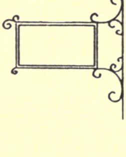
When the fascia is close up against the wall of a building, the revolving shutters may be coiled up under the bressummer or girder carrying the wall.



Revolving shutters of the following heights will coil up into the following diameters; the shutter space should be made somewhat larger for clearing and easy working—say, about 2 in. all round:—

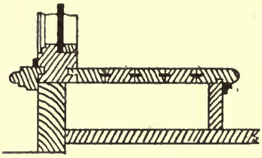
Height of Shutter in Feet.	Diameter of Coil in Inches. Wood.	Iron.	Steel.
4	8	7	7
5	9	7¼	—
6	10	8½	8
7	11	9	—
8	11½	10	9½
9	12	10½	—
10	12½	11½	10
11	13	11¾	—
12	13¼	12	11¾
13	13¾	12½	—
14	14	12¾	12
15	14½	13	—
16	15	13½	13
17	15½	13¾	—
18	16	14	13½
19	16½	14¼	—
20	17	14¾	14
24	18	15¾	15
30	22	20	17

Notice board.

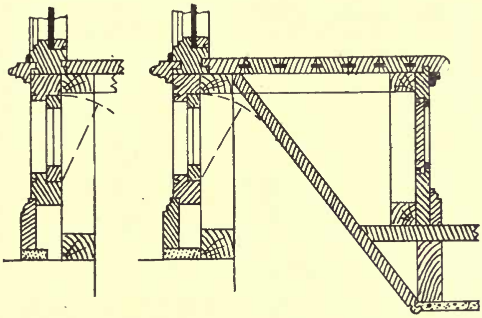


Put two enamelled iron (or opaque glass) movable tablets 15 in. × 9 in., in gun-metal frames, fixed to pilasters with ornamental brackets and heads, and printed, "We close at 6 o'clock" (or other form of notice).

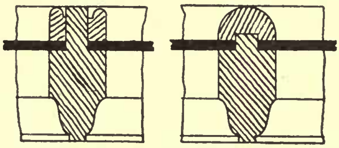
When the show-board is of low height, such as in a draper's establishment, the stall-board may be a $2\frac{1}{2}$ in. (or 3 in.) wrought deal timber, with a moulded capping and no skirting. The show-board would be fixed on joists laid on the ground floor joists, with the flooring over and a plain rebated riser at back.



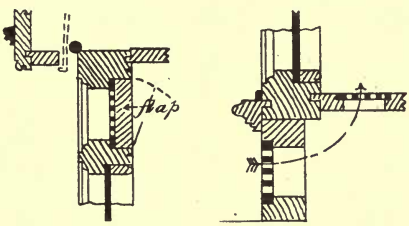
When the show-board is high, such as in a baker's or jeweller's establishment, the stall-board panelling may be glazed with $\frac{3}{4}$ in. ribbed or plain cast plate glass, to let in light to a cellar below, or small glazed hinged sashes with fastenings may be provided, for ventilation and light. Also see Glazier, clause No. 18, for reflecting stall-board lights. The show-board may be sloped on the under side, and lined with 1 in. wrought, grooved and tongued boarding, with staff bead on edge to the ceiling below.



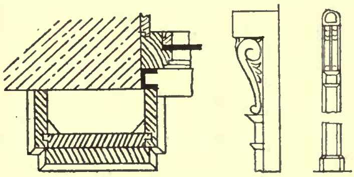
Instead of 4 in. × 3 in. mullions, $1\frac{1}{2}$ in. (to 2 in.) × 3 in. twice rebated and moulded vertical bars, with loose beads and brass cups and screws, may be provided.



Instead of using the fanlights for ventilation, $\frac{3}{8}$ in. perforated cast-iron ventilators may be fixed in the fanlight framing, with 1 in. deal flaps on the inside, hinged on 2 in. brass (or iron) butts, and provided with spring catches. The stall-board may have hit-and-miss iron (or brass) gratings for ventilation, with similar gratings placed in the show-board.

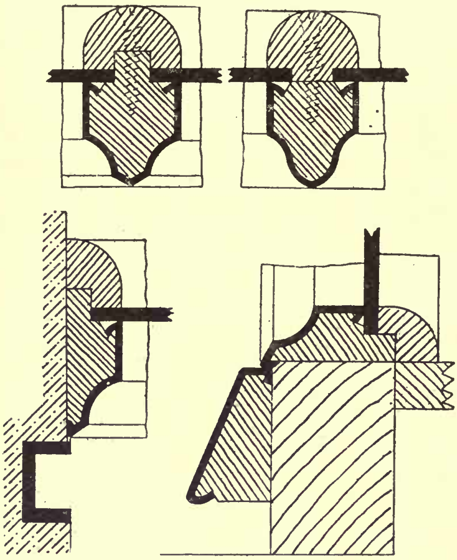


When the pilasters at the sides of a shop are framed up in deal, they may be described somewhat similar to notes under clause No. 206, and mention the carved ornamental brackets above.



Brass sash bars.

(316)—When the shop front is formed with brass sash bars, describe them thus:—



The shop front to be formed with head, sill, mullions and sash bar framing in moulded polished brass $\frac{3}{32}$ in. thick, with wood cores and bead fillets screwed on, and with iron vertical stiffeners (standards) at back.

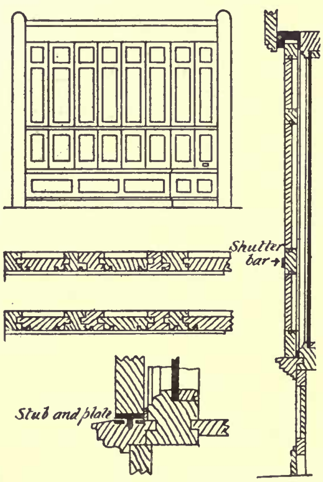
The stall-board name-plate to be in moulded polished brass 15 in. (or other) girth, $\frac{3}{32}$ in. thick, on deal core, with ornamental (or plain) mitred caps (shields) at angles, with the name of the firm engraved and enamelled black, and the whole made movable with brass stubs and plates.

The size of the sash bars varies according to the height of the shop front. The name-plate may vary in girth. The thickness of metal may be described in B.W.G. sizes.

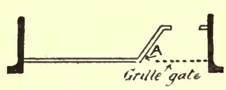
The iron vertical stiffeners (standards) are only required for strength when the sash bar framing is very light.

Lifting (movable) shop shutters.

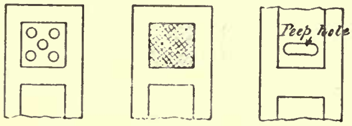
(317)—The shutters to be $1\frac{1}{4}$ in. (1 in. or $1\frac{1}{2}$ in.) bead butt (or bead flush) and square wrought deal three-panel high framings in 14 in. widths, beaded and rebated (or tongued, beaded and grooved) together, having $3\frac{1}{2}$ in. styles, middle and frieze rails and $4\frac{1}{2}$ in. top and bottom rails. Each shutter to have two iron stubs and plates on bottom rail, with corresponding plates screwed to stall board, the last shutter being provided with a brass (or iron) flush shutter lift. The shuttering to fit at top into an oak (or deal) groove under the fascia, and provided with a $1\frac{3}{4}$ in. $\times$ $\frac{1}{4}$ in. wrought-iron shutter bar with plates and fastenings, and a padlock, p.c. 5s., to lock on the inside. Each shutter to be numbered at the back.



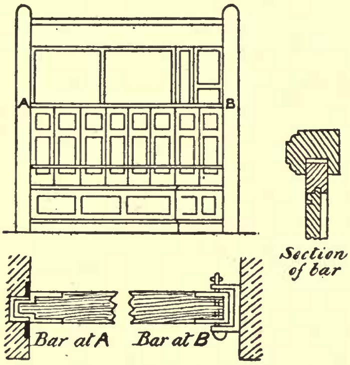
When the shutters go round the angle of a shop front, the shutter bar must have a knuckle joint at point A.



State if the top panels of shutte rshave perforated holes drilled for ventilation, if filled in with $\frac{3}{8}$ in. perforated cast-iron grating, or if a peep-hole is cut in the middle panel of one or more of the shutters.



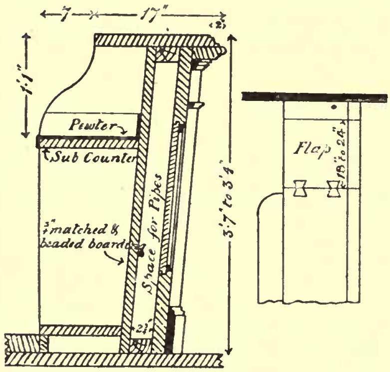
If half or three-quarter shuttering be required describe in a similar manner, with the addition of a $3\frac{1}{2}$ in. $\times$ 3 in. wrought deal weathered, beaded and grooved horizontal fixing bar, shaped at one end with a $\frac{3}{16}$ in. wrought-iron plate iron tenon fitting into a $\frac{1}{4}$ in. wrought-iron socket plate secured to the one pilaster; the other end of bar to be cased round with a $\frac{3}{16}$ in. wrought-iron plate fitting into a $\frac{1}{4}$ in. wrought-iron socket support secured to the other pilaster, and provided with a wrought-iron rose-headed pin with eye-hole, and a padlock, p.c. 5s.

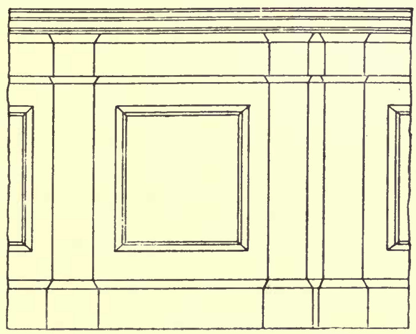


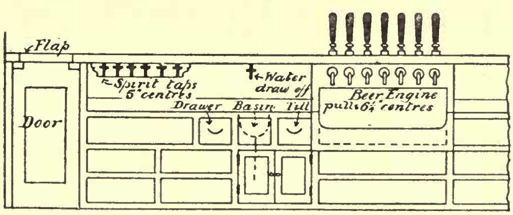
When half or three-quarter shuttering goes round an angle shop front, an angle fixing post will be necessary at the angle.

The groove in the fixing bar may be formed with a $3\frac{1}{2}$ in. $\times$ $\frac{3}{16}$ in. plate screwed on at the back of a $3\frac{1}{2}$ in. $\times$ $2\frac{1}{4}$ in. deal fixing bar with screws every 3 in. apart.

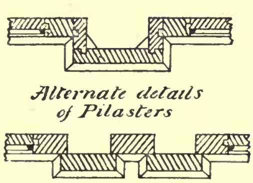
Public Bar Counter and Fittings.







Inside View of Counter



Alternate details of Pilasters

Counter top.

(318)—$1\frac{1}{4}$ in. (or $1\frac{1}{2}$ in.) wrought Honduras mahogany top, 17 in. total (15 in. to 18 in.) width, moulded on the one edge, with an extra moulding $1\frac{1}{4}$ in. (to $1\frac{1}{2}$ in.) thick screwed on underneath. Form flap 1 ft. 9 in. long, hung on brass counter flap hinges and provided with two 6 in. brass bolts and fillet stops.

Counter front.

$1\frac{1}{4}$ in. (or $1\frac{1}{2}$ in.) Honduras mahogany moulded and square framed panelling, with 1 in. similar (or framed) pilasters, $1\frac{1}{2}$ in. $\times$ $1\frac{1}{4}$ in. capping moulding, 1 in. $\times$ $\frac{3}{4}$ in. necking moulding and 7 in. $\times$ $\frac{3}{4}$ in. moulded skirting. The front to slant 5 in. out of the vertical, and the whole to be made movable with brass cups and screws (or flush bolts), for access to the pipes at the back, and secured to framed grounds, backings, blocks, bearers and other fixings. Leave a $2\frac{3}{4}$ in. space at the back for access to the pipes, with a $\frac{3}{4}$ in. wrought deal grooved and tongued back casing. The counter front immediately below the counter flap to be formed with a door, hung on 3 in. brass butts, and provided with a brass catch and two 6 in. brass bolts.

Sub or under counter.

$1\frac{1}{4}$ in. wrought deal, covered with polished pewter weighing $3\frac{1}{2}$ lbs. per foot super, turned up 4 in. (to 7 in.) at back with a moulded bead edging, pewter cheeks, drips and burnt joints.

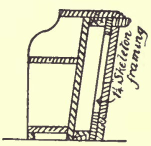
Shelves, divisions and fitments.

1 in. wrought deal shelves, divisions, standards, fittings, cupboards, drawers, till drawer, and raised plinth board on bearers, with brass handles, locks and hinges to cupboards, and brass lock to drawer till.

Oil and varnish.

Oil in the counter top, twice varnish the counter front as well as the moulded edge to counter top, stain, size and twice varnish the edges of all fittings beneath counter at back, as well as the drawers, till, and cupboard fronts.

The counter front may be formed to various designs. The simplest form of counter front may be framed up with 1 in. wrought V-jointed (or matched and beaded) grooved and tongued boarding, with moulded skirting, twice varnished (or painted).



Counter screens.

Allow a p.c. sum or fully describe them. These are for obscuring the view across from one counter to another.

Glass and hand basin.

Put one (or more) 11 in. sunk circular pewter basin with brass plug, chain and union and $\frac{5}{8}$ in. electro-plated cock with boss, and take 1 in. lead waste-pipe to gulley in basement. Lay on $\frac{5}{8}$ in. lead water supply with stop-cock.

Beer engine.

Put one (or more) seven-pull town made quadrant action beer engine with $\frac{1}{2}$ pint pumps, 12 in. ebony pull handles, electro-plated german silver mountings and spouts, indiarubber seatings, improved bar grating, and one tapping-cock and ceiling union to each pull; and lay on $\frac{9}{16}$ in. lead pipe to casks in cellar.

Spirit taps. One (or more) shaped mahogany tap rail, with six town made electro-plated german silver spirit-taps and bosses, one diamond top spirit drainer 24 in. × 6 in. flush under spirit-taps, and two sunk pewter funnel stands, metal rims. Lay on $\frac{7}{16}$ in. tin pipes from spirit-tap to spirit store, and case in for access to pipes with movable casing.

Samples of all beer engines, taps and fittings to be of the latest improvements, and to be submitted to and approved of by the architect.

Spirit-taps are placed 5 in. centres, beer engine spouts $6\frac{1}{4}$ in. centres.

In alterations state that a temporary serving bar and fittings are to be provided.

For tin pipe, see Zincworker, clause No. 9.

If the counter top is to be covered with pewter, see Zincworker, clause No. 10.

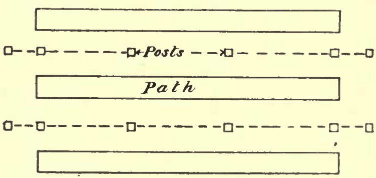
As to the number of engines, taps and other fittings and fitments under the counter, the employer must state his requirements. It is a good plan to raise the floor at the back of the counter, as it gives the attendants more command.

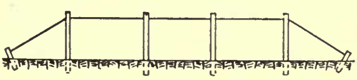
Shop counter. **(319)**—Shop counters would be constructed somewhat in a similar way as under clause No. 318, but the counter-tops would be wider, say up to 3 ft. The fittings under the counter would be arranged to suit the requirements of the various trades.

Confectioners sometimes cover the counter tops with polished marble $1\frac{1}{4}$ in. thick, rounded or moulded on front edge.

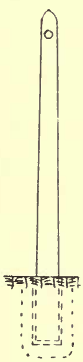
Drying ground and clothes posts. **(320)**—Excavate ground over the whole area of drying ground (state depth) and cart away. Spread 4 in. (6 in. or 3 in.) coarse ballast to pass a 2 in. ring, well ram, water and roll with a 4 cwt. hand roller, and finish with 2 in. (or 3 in.) good binding gravel and hoggin, watered and rolled as before.

Form gangways between each line of posts 2 ft. (or 2 ft. 6 in.) wide on a 4 in. cement concrete foundation with 7 in. × 1 in. rough boarded edging on both sides; fill in on top with tar paving 3 in. thick to falls, composed of gravel (or limestone clippings) screened through sieves having $1\frac{1}{4}$ in.





Elevation of Clothes Posts



Section through Path

and $\frac{1}{2}$ in. meshes, and mixed in the proportion of 1 ton gravel (or stone clippings), 12 gallons gas tar, $\frac{1}{2}$ cwt. pitch and 2 gallons creosote. The larger stones to be placed at the bottom and worked up with the finer stones at the top. Dress over with fine grit (or stone dust), and roll with a 10 cwt. hand roller.

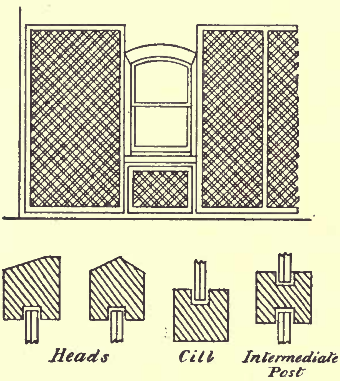
See notes to, and clauses Nos. 2 and 3 under "Road-making."

Put twelve wrought deal clothes posts (say 20 ft. apart) 8 ft. high, 4 in. square at the feet, tapering to $3\frac{1}{2}$ in. square at the top and rounded off, with gun-metal eyes fixed 9 in. down. The posts to be movable and fixed into heavy cast-iron sockets 2 ft. deep with lids, painted three oils and bedded in concrete 6 in. all round.

Provide best hemp clothes line to each range of posts, secured at the ends to brass (or iron) cleats fixed to 5 in. × 5 in. wrought oak dwarf posts 2 ft. long, let into ground and surrounded with concrete 6 in. thick.

Trellis (lattice) work.

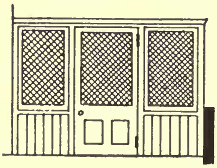
(321)—Trellis-work is mainly used for training up creepers and roses.



Cover the south and west sides of house from ground to first floor level with wrought trellis-work formed of $1\frac{1}{4}$ in. × $\frac{1}{2}$ in. (or 1 in. × $\frac{1}{4}$ in.) laths 2 in. (to 4 in.) apart, nailed at laps, and fitted into $1\frac{3}{4}$ in. × $1\frac{1}{2}$ in. wrought grooved sills and side pieces with $1\frac{3}{4}$ in. × $1\frac{1}{2}$ in. grooved and weathered (or twice weathered) heads and $1\frac{3}{4}$ in. × $1\frac{3}{4}$ in. twice grooved intermediate posts. Fix to walls with wall hooks, and paint the whole three coats in oil colour.

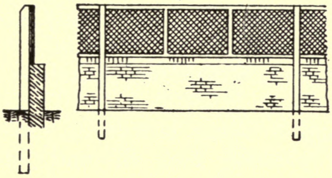
The laths may also be fixed on the face of the framings which would not then be grooved.

If the laths be some 6 in. to 9 in. apart they may be out of 2 in. × $\frac{3}{4}$ in. (or 1 in.) stuff, the framing being correspondingly stronger.



Trellis-work is also used in the upper parts of side screen gates and porch framings; the laths may be placed from $1\frac{1}{4}$ in. to 6 in. apart.

When trellis work is fixed on top of a garden wall, take $4\frac{1}{2}$ in. × 4 in. (or $5\frac{1}{2}$ in. × 4 in.) wrought posts every 8 ft. to 10 ft. apart, with the feet charred (or tarred) and bedded 3 ft. in the ground, and secured to the wall with $\frac{1}{2}$ in. bolts, nuts, heads and washers every 3 ft. apart, and screwed to the trellis framing.

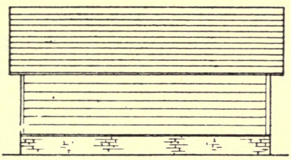


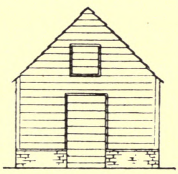
Weather Boarding to Sheds and Cottages.

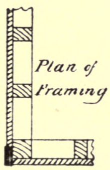
(Clauses Nos. 322 and 323.)

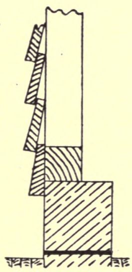
Weather (feather edged) boarding to sheds.

(**322**)—The framing to outhouse wooden sheds may be put together in a similar way to quartered partitions, see clauses Nos. 135 and 136. The sill may be in oak, and the whole fixed on a brick and concrete foundation with a damp course.



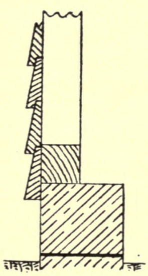






Cover the outside of shed with sawn fir weather (feather edged) boarding laid horizontally in 7 in. widths, $\frac{3}{4}$ in. average thickness, four boards being cut out of a 7 in. × 3 in. deal, lapped $1\frac{1}{4}$ in. (or $1\frac{1}{2}$ in.) at joints, butted at angles, and spiked to framing with $1\frac{1}{4}$ in. cut nails, and scribed to gables. Finish the angles with a 5 in. × $1\frac{1}{4}$ in. (or $1\frac{1}{2}$ in.) sawn vertical piece.

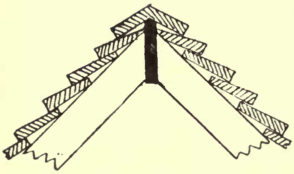
or,



Cover the outside of shed with sawn fir rebated weather (feather edged) boarding laid horizontally in 7 in. widths, $\frac{3}{4}$ in. average thickness, four boards being cut out of a 7 in. × 3 in. deal, lapped $1\frac{1}{4}$ in. (or $1\frac{1}{2}$ in.) at joints, butted at angles, spiked to framing with $1\frac{1}{4}$ in. cut nails and scribed to gables. Finish the angles with a 5 in. × $1\frac{1}{4}$ in. (or $1\frac{1}{2}$ in.) sawn vertical piece.

Describe any doors as clauses Nos. 263 to 265, and any windows as clause No. 170 modified as simply as possible, to very few labours.

State in either case if edges of boarding are shot.



Cover roof with similar horizontal weather (feather edged) boarding laid to a pitch of not less than 26°·30′ (about $\frac{1}{4}$ the span) (or 45°, about $\frac{1}{2}$ the span). The roof timbers would be similar to ordinary roof framings, see clauses Nos. 74 to 76, 100, 101, 107 to 110, and 112; and if barge boards or ventilators are required, see clauses Nos. 87 and 99 respectively.

Finish the ridge (hips and valleys are never formed in this class of roof) with a fir ridge piece having 6 in. (or 8 in.) wings cut out of the solid.

Pay over the boarding externally to the sides and roofs (and perhaps internally) with two (or three) coats of tar mixed in the proportion of 1 gallon tar to 1 pint petroleum oil.

The roof may be covered with ordinary boarding and felt thus:—

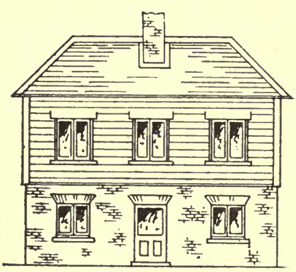
Cover the roof with 1 in. ($\frac{3}{4}$ in., $1\frac{1}{4}$ in., $1\frac{1}{2}$ in., or 2 in.) rough boarding laid horizontally with edges shot (or grooved and tongued), and lay asphalted roofing felt about $\frac{1}{8}$ in. thick stretched tight, lapped 2 in. (or 3 in.) at joints, and fixed with $1\frac{1}{8}$ in. iron clout nails 5 (or 6) lbs. per 1000 dipped in oil, and pay over the whole with one coat of hot coal tar and lime composition, in the proportion of 3 parts coal tar to 1 slaked lime, and then sprinkle over with fine sand.

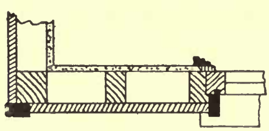
The pitch to a roof covered with felt may be at an angle of 3°·50′, or $\frac{1}{30}$ span. Zinc or copper nails may also be used for fixing the felt. When felt is painted, first limewhite over one coat, then paint one coat in oil (no turps), then sprinkle fine white silver sand, and then paint four or five coats in oil.

Weather boarding to buildings is generally used in outside sheds and farm buildings. It is sometimes in oak.

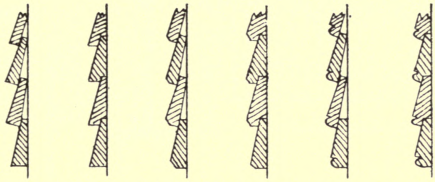
Weather (feather edged) boarding to cottages.

(323)—In small cottages and similar class of building, either a portion or the whole of the external walls is sometimes covered with weather boarding. Describe the wall framing, the weather boarding and tarring similar to clause No. 322; and state that the angles are butted up against a 3 in. (or 4 in.) × $1\frac{1}{4}$ in. (or $1\frac{1}{2}$ in.) wrought deal angle fillet (and perhaps staff-beaded on edge).



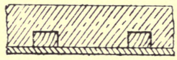


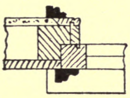
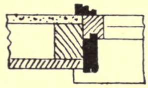
State if the weather boarding is wrought on the weather side and painted, which is often the case. Wrought weather boarding may also be beaded or splayed on edge.



Various forms of Weather boards

Weather boarding may be fixed against brick walls, spiked to 4½ in. × 3 in. studs every 3 ft. apart.



Windows with solid frames are generally used in this class of work, and may be fixed  *or* . See clause No. 170 for the window frames, which should be modified as simply as possible, with few labours. Describe the projecting sills in oak or deal (not stone) with a moulding beneath. Describe the 1¼ in. external wrought rebated and beaded (or moulded) linings to the reveals and heads of windows, or an architrave moulding, and an 1¼ in. wrought weathering piece with small cut brackets over the window heads. In this class of work the door may have a timber framed projecting head, as in the notes to clause No. 255, page 248.

(324)—

Fencing and Gates.

(Clauses Nos. 325 to 331.)

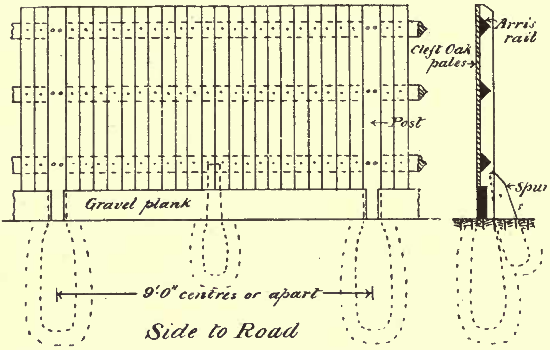
For brick boundary walling see Bricklayer, clauses Nos. 98 and 99.
For flint boundary walling see Bricklayer, clauses Nos. 105 to 107.
For rubble stone boundary walling see Mason, clause No. 109.

Oak post and pale fencing (close fencing).

(325)—Fence round estate with:—

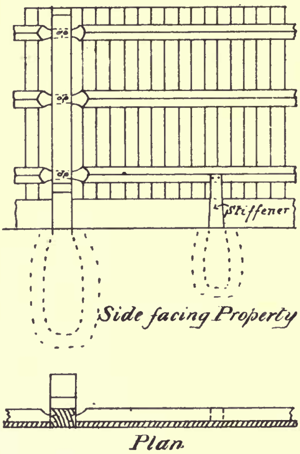
4½ in. × ½ in. cleft oak pales 6 ft. high in one height, overlapping 1 in., and nailed to the arris rails with rose-headed nails.

6 in. × 6 in. angle and 6 in. × 4 in. intermediate sawn (or wrought) oak posts 9 ft. high, 9 ft. apart (or centres), weathered on top, with the butt ends charred (or tarred), and let 3 ft. into ground, and surrounded with cement concrete 9 in. (to 12 in.) thick.



6 in. × 6 in. sawn (or wrought) oak spurs framed into posts, with the butt ends charred (or tarred), and let into ground 2 ft. 6 in., and surrounded with concrete 9 in. thick.

Three sawn (or wrought) oak arris rails each out of 4 in. × 4 in., housed into posts and pinned with $\frac{3}{4}$ in. diameter tapered oak treenails (pins) finished flush each side.



11 in. × $1\frac{1}{2}$ in. sawn (or wrought) oak gravel plank housed into posts, with a 4 in. × 3 in. sawn (or wrought) oak stiffener at the centre between each post, and oak pinned into arris rail, and the butt end charred (or tarred), and let 18 in. into the ground.

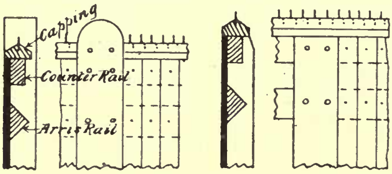
Cart gates. If cart gates are required they may either be in deal or oak similar to clause No. 267; or they may be framed up in deal or oak in a similar way as the same clause, but covered on the outside with cleft oak pales to match the fencing. In this latter case the styles, rails and braces would all be the same thickness.

Side gates. If side gates about 3 ft. 6 in. (3 ft. or 4 ft.) wide be required in several positions, they may also either be in deal or oak similar to clause No. 267; or they may be framed up in deal or oak in a similar way as the same clause, and covered on the outside with cleft oak pales to match the fencing. In this latter case also the styles, rails and braces would all be the same thickness. For open-framed wicket gates, see clause No. 330.

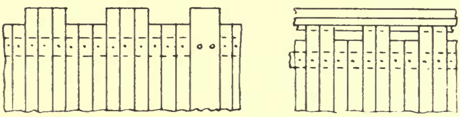
Carriage gates For carriage entrance gates, see clauses Nos. 267 to 269 or 330.

Excavating. Level the ground for fencing, excavate for posts, spurs, stiffeners and concrete, and fill in and ram.

State if the fencing be finished with a 3 in. × $1\frac{1}{2}$ in. oak saddle back (or 3 in. × 3 in. moulded) capping, with $2\frac{1}{2}$ in. × 2 in. oak counter rail housed into posts (or running across the posts), and if studded with galvanised iron tenter hooks.



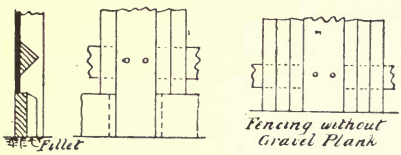
This class of fencing is suitable as an enclosure for parks or good class property. It is a general custom in fixing all classes of fencing of whatever description to show the fair side to your neighbour or to the public highway, as the case may be.



State if the oak pales are cut to alternate heights, either in one, two or three pales in width, and if with the capping and counter rail on top.

The post may be semicircular on top.

The gravel plank may be fixed at the ends to 3 in. × 2 in. oak fillets spiked to the posts, instead of being housed into the posts. A gravel plank is not always put.



Cleft oak pales are usually cut :—

3 ft. high, with 5 in. × 4 in. posts 9 ft. apart (or centres) 5 ft. high, and require two arris rails each out of 4 in. × 4 in.

3 ft. 6 in. high, with 5 in. × 4 in. posts 9 ft. apart (or centres) 6 ft. high, and require two arris rails each out of 4 in. × 4 in.

4 ft. high, with 5 in. × 4 in. posts 9 ft. apart (or centres) 7 ft. high, and require two arris rails each out of 4 in. × 4 in.

4 ft. 6 in. high, with 6 in. × 4 in. posts 9 ft. apart (or centres) 7 ft. high, and require two (or three) arris rails each out of 4 in. × 4 in.

5 ft. high, with 6 in. × 4 in. posts 9 ft. apart (or centres) 8 ft. high, and require three arris rails each out of 4 in. × 4 in.

5 ft. 6 in. high, with 6 in. × 4 in. posts 9 ft. apart (or centres) 8 ft. 6 in. high, and require three arris rails each out of 4 in. × 4 in.

6 ft. high with 6 in. × 4 in. posts 9 ft. apart (or centres) 9 ft. high, and require three arris rails each out of 4 in. × 4 in.

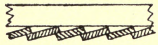
6 ft. 6 in. high, with 6 in. × 4 in. posts 9 ft. apart (or centres) 9 ft. 6 in. high, and require three (or four) arris rails each out of 4 in. × 4 in.

7 ft. high, with 6 in. × 4 in. posts 9 ft. apart (or centres) 10 ft. high, and require three (or four) arris rails each out of 4 in. × 4 in.

7 ft. 6 in. high, with 6 in. × 6 in. posts 9 ft. apart (or centres) 10 ft. 6 in. high, and require three (or four) arris rails each out of 4 in. × 4 in.

8 ft. high, with 6 in. × 6 in. posts 9 ft. apart (or centres) 11 ft. high, and require four (or five) arris rails each out of 4 in. × 4 in.

Instead of oak pales being cleft, they may be sawn, 4 in. × $\frac{3}{4}$ in. either feather-edged or square.



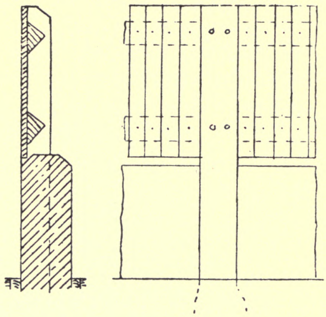
Oak gravel planks are cut $1\frac{1}{2}$ in. thick by 6 in., 7 in., 9 in. and 11 in. deep.

Oak arris rails are cut out of 3 in. × 3 in., 4 in. × 4 in. and 5 in. × 5 in. Arris rails may also be in ash or fir. For square cut rails see notes under clause No. 326.

Oak posts are cut 5 in. × 4 in., 6 in. × 4 in. and 6 in. × 6 in. Posts in ash or fir are cut 5 in. × 4 in., 6 in. × 4 in. and 6 in. × 5 in.

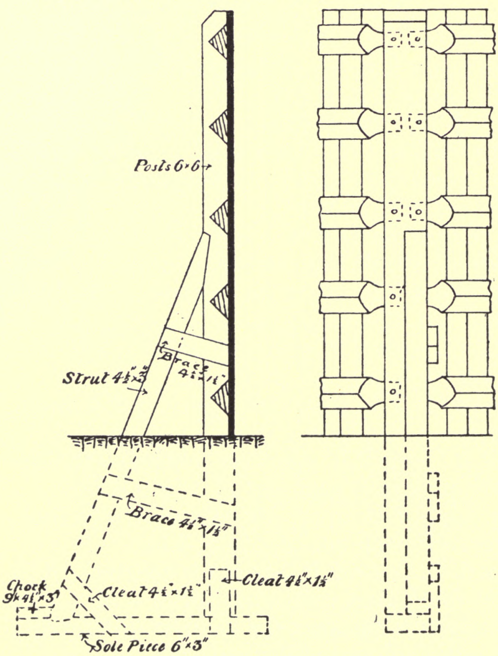
Oak treenails (pins) are cut from $\frac{3}{8}$ in. to $\frac{3}{4}$ in. diameter by 3 in. to 6 in. long.

By surrounding the butt ends of the posts in concrete the fencing is made stiffer.



Dwarf oak pale fencing is frequently fixed on a dwarf brick wall, with the oak posts going right down into the ground. The brick wall may either be coped with brick in cement or double splayed coping bricks.

When the fence is high, say some 7 ft. or 8 ft., instead of a spur being put at the foot, the posts may have framed stiffeners formed with :—



Posts 6 in. × 6 in.

Sole pieces 6 in. × 3 in.

Struts $4\frac{1}{2}$ in. × 3 in.

Braces $4\frac{1}{2}$ in. × $1\frac{1}{2}$ in.

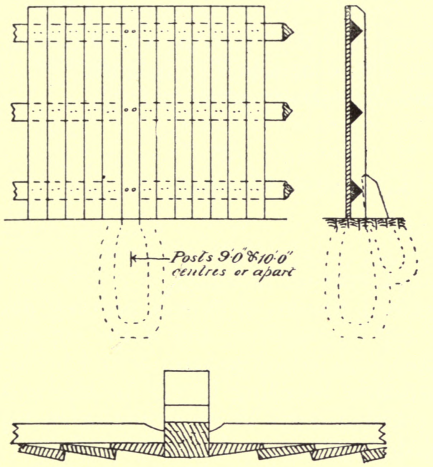
Cleats $4\frac{1}{2}$ in. × $1\frac{1}{2}$ in.

Chocks $4\frac{1}{2}$ in. × 9 in. × 3 in.

Fir weather boarded fencing (close fencing).

(326)—Fence round estate with:—

Sawn fir weather (feather edged) boarding in 6 ft. heights, 7 in. widths, $\frac{3}{4}$ in. average thickness, four boards being cut out of a 7 in. × 3 in. deal, lapped 1 in. at joints, and spiked to each arris rail with two $2\frac{1}{2}$ in. cut nails.



6 in. × 6 in. sawn oak angle and 6 in. × 4 in. intermediate posts 9 ft. high, 9 ft. (or 10 ft.) apart (or centres), weathered on top, with the butt ends charred (or tarred), and let 3 ft. into ground and surrounded with cement concrete 9 in. (or 12 in.) thick.

6 in. × 6 in. sawn oak spurs framed into posts, with the butt ends charred (or tarred) and let into ground 2 ft. 6 in. and surrounded with concrete 9 in. thick.

Three sawn oak arris rails each of 4 in. × 4 in., housed into posts and pinned with $\frac{3}{4}$ in. diameter tapered oak treenails (pins) finished flush each side.

Cart gates. For cart gates see clause No. 325; but in lieu of the oak pales fir weather boarding would be fixed.

Side gates. For side gates see clause No. 325; but in lieu of the oak pales fir weather boarding would be fixed.

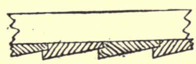
Carriage gates. For carriage entrance gates see clause No. 325.

Tarring. Pay over all fir and oak parts of fencing on both sides with two coats of tar, mixed in the proportion of 1 gallon tar to 1 pint petroleum oil.

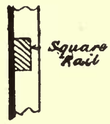
Excavating. Level ground for fencing, excavate for posts, spurs and concrete, and fill in and ram.

This class of fencing is suitable for a cheaper class property.

The weather boarding may be of the same thickness and width, but rebated out.



The posts may be in oak 5 in. × 4 in., 6 in. × 4 in., and 6 in. × 6 in., or in ash or fir 5 in. × 4 in., 6 in. × 4 in. and 6 in. × 5 in.



The arris rails may be out of 3 in. × 3 in., 4 in. × 4 in. and 5 in. × 5 in. oak, ash, or fir, the same number being required as with oak pale fencing, see in the notes to clause No. 325. The rails may also be cut square, say $4\frac{1}{2}$ in. × 3 in., 5 in. × 2 in., or 6 in. × 2 in.

Fir weather boarding is usually cut in 3 ft., 3 ft. 6 in., 4 ft., 4 ft. 6 in., 5 ft., 5 ft. 6 in., 6 ft., 6 ft. 6 in., 7 ft., 7 ft. 6 in. and 8 ft. heights.

The whole of the fencing may also be entirely in fir or larch,

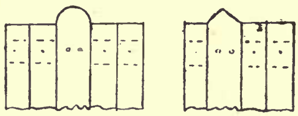
or,

with larch posts and arris rails, and fir weather boarding,

or,

with larch posts, and fir arris rails and weather boarding.

State if oak, ash, fir or larch gravel planks, stiffeners, capping and counter rail be required, and if the capping be studded with galvanised iron tenter hooks; if the weather boarding be cut to alternate heights; and if posts be semicircular on top or pointed, see notes to clause No. 325.

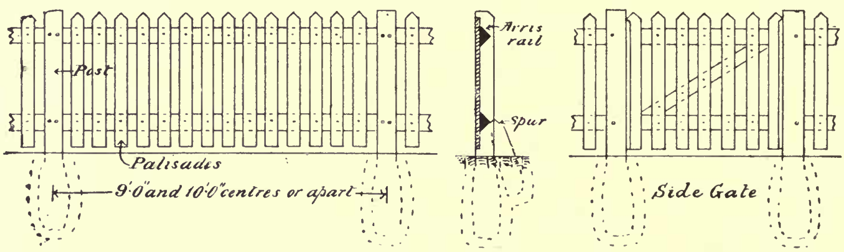


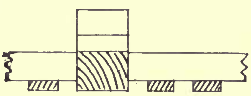
For dwarf fencing and very high fencing, see notes to clause No. 325.

Post and rail fencing with palisades (open fencing).

(327)—Fence round estate with:—

3 in. ($3\frac{1}{2}$ in. or 4 in.) × 1 in. ($1\frac{1}{4}$ in. or $1\frac{1}{2}$ in.) wrought fir palisades 4 ft. high, pointed (or rounded) at top, spaced $2\frac{1}{2}$ in. (3 in. or 4 in.) apart and nailed to each arris rail.





5 in. × 5 in. angle and 5 in. × 4 in. intermediate wrought oak posts 7 ft. high, 9 ft. (or 10 ft.) apart (or centres), weathered (double pointed or double rounded) on top and the butt ends charred (or tarred) and let 2 ft. 9 in. into ground and surrounded with concrete 9 in. (to 12 in.) thick; 5 in. × 5 in. wrought oak spurs framed into posts, with the butt ends charred (or tarred) and let 2 ft. 6 in. into ground and surrounded with concrete 9 in. thick.

Two wrought fir (or oak) arris rails, each out of 4 in. × 4 in., housed into posts and pinned with $\frac{3}{4}$ in. diameter tapered oak treenails (pins) finished flush each side.

Cart gates.

The cart gates might be somewhat similar to the wicket gate, with the fir palisades fixed on to rather stronger skeleton framing. The hinges and fastenings might be similar to a field gate, see clause No. 331, with perhaps a padlock.

Side or wicket gate.

The wicket gate to be framed up with 3 in. × $3\frac{1}{2}$ in. wrought deal fixing and hanging styles, 4 in. × 2 in. rails and lace, and similar palisades, and hinged with 18 in. strap and pivot hinges against 1 in. × 1 in. oak fillets, and secured with latch and lock, p.c. 7s.

Carriage gates.

For carriage entrance gates see clause No. 330.

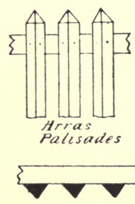
Excavating.

Level ground for fencing, excavate for posts, spurs and concrete, and fill in and ram.

Painting.

Paint the whole of the fencing on all faces with four coats of oil colour finished white (or the work may be tarred as in clause No. 326).

State if "arras" palisades are required—that is the palisades cut anglewise out of 3 in. × 3 in. or 4 in. × 4 in., and if pointed at top.



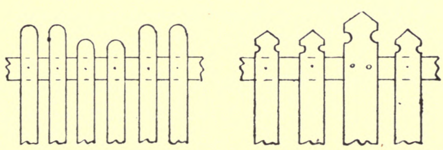
Fir palisades are usually cut in 3 ft., 3 ft. 6 in., 4 ft., 4 ft. 6 in., 5 ft., 5 ft. 6 in., 6 ft., 6 ft. 6 in., 7 ft., 7 ft. 6 in. and 8 ft. heights, and may also be in larch.

The posts may be in fir, ash, or larch, 5 in. × 4 in., 6 in. × 6 in. and 6 in. × 5 in.; and in oak, 5 in. × 4 in., 6 in. × 4 in. and 6 in. × 6 in.

Arris rails may be in oak, ash, fir, or larch, out of 3 in. × 3 in., 4 in. × 4 in., or 5 in. × 5 in. If square rails, then $4\frac{1}{2}$ in. × 3 in., 5 in. × 2 in., or 6 in. × 2 in., the same number of rails being required as with oak pale fencing, see notes to clause No. 325.

For dwarf and very high palisade fencing see note to clause No. 325, but instead of cleft pales fir palisades would be fixed.

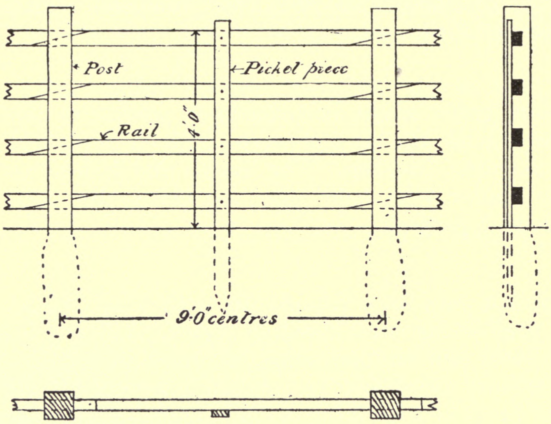
State if palisades are in alternate heights, or with ornamental tops, which may be to various designs.



Post and rail fencing.

(328)—Fence round field with:—

6 in. × 6 in. hewn oak posts 7 ft. long, 9 ft. centres, pierced for rails, and with the butt ends charred (or tarred), and let 3 ft. into ground.



Four cleft oak rails, each being ten (nine or eight) square inches in section, with the ends halved through posts.

One (or two) $3\frac{1}{2}$ in. × $1\frac{1}{2}$ in. oak picket piece (stiffener or stump) between each post spiked to each rail, pointed and charred at the foot, and driven 15 in. into the ground.

Tarring. State if fencing is tarred, as in clause No. 326.

Excavating. Excavate for posts, fill in and ram.

Field gates. For field gates see clause No. 331.

Either four, three, or two rails are usually fixed to this class of fencing, the posts generally being all the same height.

Two oak picket pieces may be fixed for additional strength.

Post and rail fencing may be wholly in oak, larch, or fir.

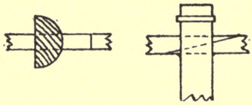
or,

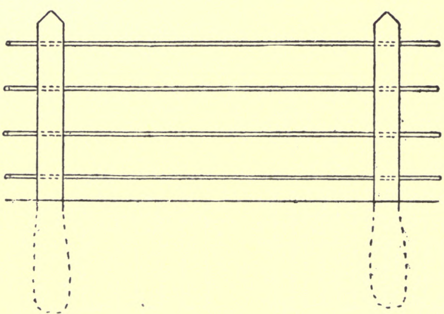
Oak posts, larch rails and picket pieces.

or,

Oak posts, fir rails and picket pieces.

The rails may be sawn. The posts may be half round, and bound round the top in hoop iron.





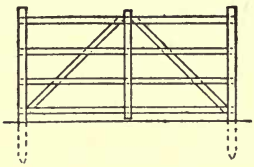
A post and wire fence similar to sketch is often used in railway work.

Rough timber spurs may be put to both these classes of fencing to act as stiffeners.

Either of these forms of fencing are usually placed round fields and woods to prevent cattle straying.

Hurdles.

(329)—Fence round field with greenwood hurdles, each being 6 ft. long, 3 ft. high, with the end posts pointed at feet, and bound round in galvanised hoop-iron at the top, and with four (or five) rails, two laces and a picket piece, and the hurdles secured together with galvanised iron wire.

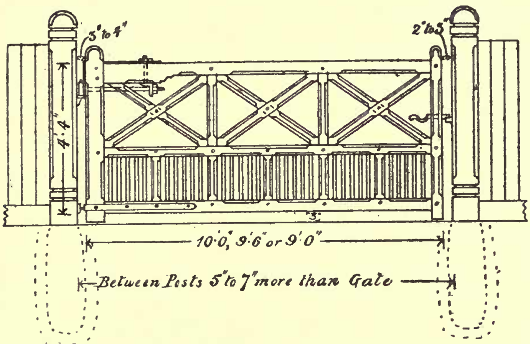


For iron hurdles, see Smith, clause No. 113.

Open framed carriage (park) and wicket gates.

(330)—Open carriage gates are made to many designs, here is a description:—

The carriage gate to be 10 ft. (9 ft. 6 in. or 9 ft.) long, 4 ft. 4 in. (4 ft. 6 in., 4 ft. 9 in. or 4 ft.) high, framed up in wrought solid English oak, stop chamfered (or moulded) on edges, oiled and twice varnished, and pinned together with $\frac{3}{4}$ in. oak treenails. The ironwork to be painted black three coats in oil colour.



The top rail to be cut out of 6 in. × $3\frac{1}{2}$ in. (or 4 in.) with shaped cut bracket at hanging style (heel), and tapered off to 4 in. × $3\frac{1}{2}$ in. at fixing style (head), and slightly rounded off (weathered or moulded) on the top edge.

4 in. × $3\frac{1}{2}$ in. (or 4 in.) hanging style (heel), shaped on top, and hung to hinge post with patent adjustable hinges, p.c. 30s.

$3\frac{1}{2}$ in. × $3\frac{1}{2}$ in. (or 4 in.) fixing style (head), shaped on top, and provided with latch and striking plate, p.c. 8s.

4 in. × $3\frac{1}{2}$ in. (or 4 in.) middle and bottom rails slightly weathered.

$3\frac{1}{2}$ in. × $3\frac{1}{2}$ in. (or 4 in.) braces and vertical intermediate ties (posts).

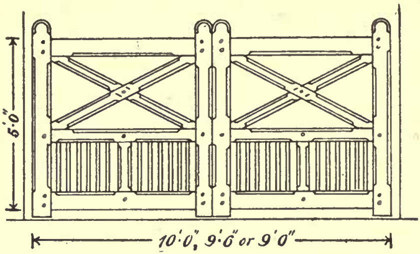
Fill in the bottom panels with $1\frac{1}{2}$ in. × $1\frac{1}{2}$ in. vertical bars at 3 in. centres.

9 in. × 9 in. falling (fixing) and hanging posts, stop chamfered on edges with ornamental shaped heads, and with the butt ends charred (or tarred), and fixed in the ground 3 ft. 6 in., and surrounded with concrete 9 in. wide.

State if a malleable-iron cresting riveted to a wrought-iron bar be required on the top rail. The gate posts may also be 10 in. × 9 in., 10 in. × 10 in. and 12 in. × 12 in.

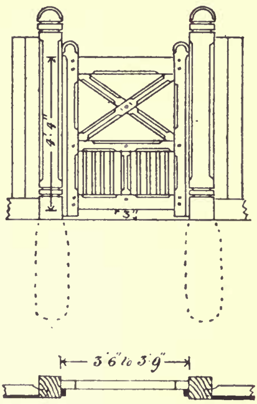
Patent cup and ball hinges or wrought strap-iron pivot hinges may be used about 3 ft. 6 in. long, secured with bolts, nuts and heads.

State if gate is in yellow pine and painted four oils white, with the iron-work black. Sometimes 1 in. wrought-iron horizontal bars and vertical rods are fixed with nuts, heads and washers, to give additional rigidity to the gate.



Open carriage entrance gates may also be hung in two halves, of various widths and heights. The gates may be hung close to the posts, similar to the wicket gate described below.

Wicket gate. This may also be in various designs, here is a description:—



To be 3 ft. 6 in. (or 3 ft. 9 in.) wide by the same height as the carriage gates, and framed up in solid wrought English oak, stop chamfered (or moulded) on edges, oiled and twice varnished. The ironwork to be painted black three times in oil colour.

5 in. × $3\frac{1}{2}$ in. (or 4 in.) top rail slightly rounded (weathered or moulded) on the top edge.

5 in. × $3\frac{1}{2}$ in. (or 4 in.) hanging and fixing styles with shaped ornamental heads, and hung to posts on 2 in. × $\frac{1}{4}$ in. wrought-iron strap and pivot hinges 18 in. long, with bolts, nuts and heads, and provided with a latch and striking plate, p.c. 8s.

5 in. × $3\frac{1}{2}$ in. (or 4 in.) middle and 6 in. × $3\frac{1}{2}$ in. (or 4 in.) bottom rails slightly weathered.

$3\frac{1}{2}$ in. × $3\frac{1}{2}$ in. (or 4 in.) braces and vertical ties (posts).

Fill in panels at bottom with $1\frac{1}{2}$ in. × $1\frac{1}{2}$ in. vertical bars at 3 in. centres.

6 in. × 6 in. falling (fixing) and hanging posts, stop chamfered on edges with ornamental heads, and with the butt ends charred (or tarred), and fixed in the ground 3 ft., and surrounded with concrete 9 in. thick. Fix on each post a 2 in. × 1 in. fillet stop rounded off on top.

State if iron cresting be required on the top rail.

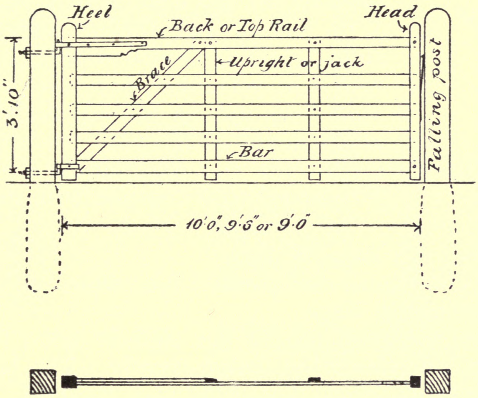
The gate posts may also be of the same sections as the carriage gate posts.

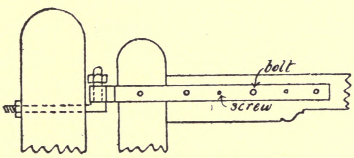
State if gates are in yellow pine, and painted four oils white, with the ironwork black.

The wicket may be hung in the same way as the carriage gate, when the width between the posts would be about 7 in. more than the width of the gate, and the fillet stops would not then be required.

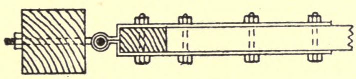
Five-barred field (or farm) gate.

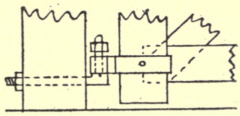
(**331**)—To be framed together in sawn (or wrought) solid English oak 10 ft. (9 ft. 6 in. or 9 ft.) long, 3 ft. 10 in. high, oiled over, and pinned together with $\frac{3}{4}$ in. oak treenails, and with the ironwork painted black in three coats oil colour.



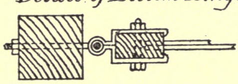


Detail of Top Hinge





Detail of Bottom Hinge



The top rail (beam or back) to be out of 6 in. × 3 in. with shaped cut bracket at hanging style, and tapering off to 3 in. × $2\frac{1}{2}$ in. (or 3 in.) at fixing style (head), and slightly rounded off (or weathered) on top.

5 in. (or $4\frac{1}{2}$ in.) × 3 in. hanging style (hinge tree,

arrow or heel) shaped on top, and hung to hinge post with 2 in. × $\frac{1}{4}$ in. wrought-iron strap and pivot hinges 2 ft. 6 in. long secured with $\frac{1}{2}$ in. bolts, nuts and heads, and provided with a field latch, p.c. 6s. The pivots to be secured to the post with nuts and washers.

3 in. × 2$\frac{1}{2}$ in. (or 3 in.) fixing style (head), rounded on top.

Five 3$\frac{1}{2}$ in. × 1 in. (or 3 in. × $\frac{3}{4}$ in.) sawn bars (slits), tapering off to 3 in. × 1 in. (or $\frac{3}{4}$ in.) and slightly rounded on top edge, with a 4 in. (or 3$\frac{1}{2}$ in.) × 1 in. similar lace (brace) and two (or three) jacks (uprights or downrights), secured together with $\frac{1}{4}$ in. galvanised iron rose-headed rivets.

9 in. × 9 in. falling (fixing) and hanging posts, rounded on top, and with the butt ends charred (or tarred), and fixed in the ground 3 ft., and surrounded with concrete 9 in. thick.

Sometimes cleft oak bars are used.

State if in yellow pine, and painted four times oil colour, finished white, with the ironwork black.

The lower hinge should project out slightly more than the upper hinge; the gate will then close automatically. The lace should terminate at the upper end about 4 ft. away from the heel.

A bridle gate to match a field gate would be formed in exactly the same way, but 4 ft. wide, and without the jacks. Field gates often have only four bars. A heave gate is a movable palisade gate with an additional movable top bar, which all lift away from mortises in the gate posts; they are about 10 ft. long × 3 ft. 10 in. high.

Field or farm gates are often called barred gates, but a barred gate correctly speaking merely consists of loose movable bars fixed into two posts.

(332)—

Half-Timber Work.

Half-timber work to buildings is generally framed, either in fir, pitch-pine, or oak, backed with brickwork, and cemented over on the outer face between the timbers.

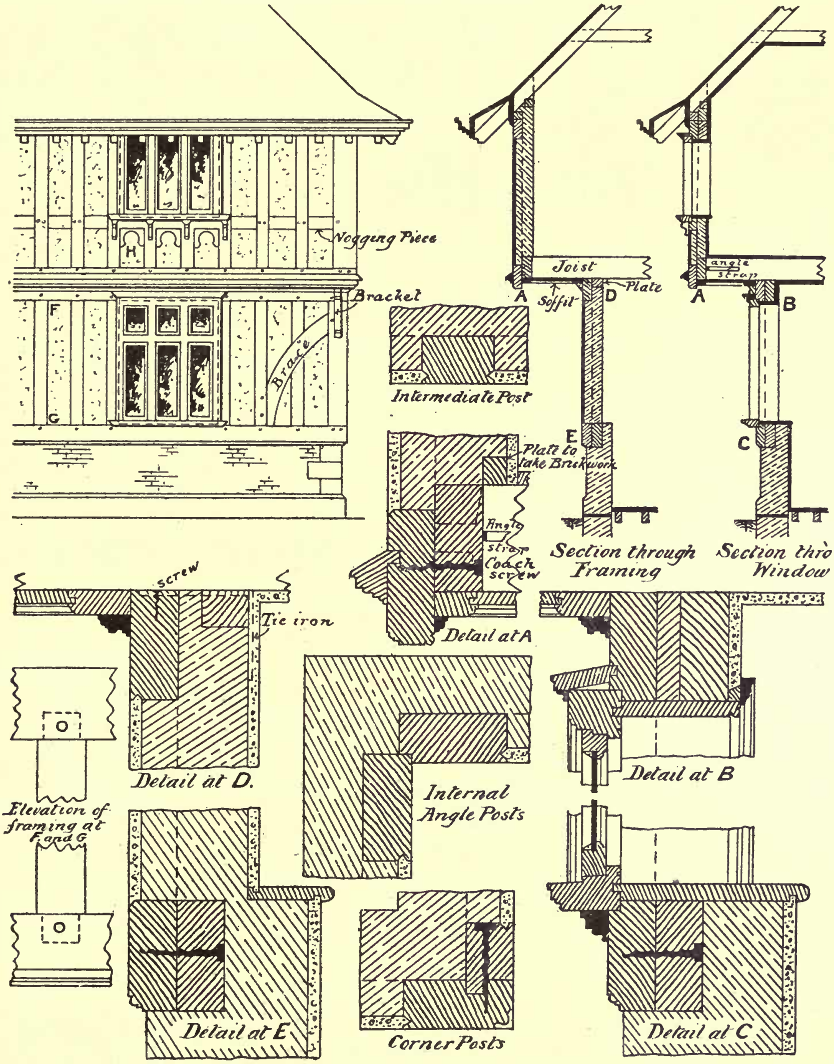
The timbers may either be oiled, painted, or tarred, and the cement work either coloured or painted.

The overhanging stories in half-timber work are supported upon the floor joists which project out for that purpose.

The timbers are spaced apart entirely to suit the design, and should not be less than 4 in. thick. The brick backing should be at least 9 in. thick.

External framing to half-timbered building.

(333)—The timber framing to be in sawn solid oak, wrought and oiled over on the faces exposed to the weather, skew-grooved and weathered to receive 1 in. external stucco (cement or pebble dash), grooved for mouldings, rebated for door and window frames and angle posts, mortised and tenoned together, and pinned at each joint with one (or two) 1 in. diam. oak tree-nail (pin) projecting $\frac{5}{8}$ in. (or $\frac{3}{4}$ in.) out from the face of the framing with the head rimmed off $\frac{1}{8}$ in.



The ground floor framing to be (say) 7 ft. total height, consisting of:—

Two 9 in. (7 in. or 11 in.) × 4 in. timbers as sill-piece, projecting $1\frac{1}{2}$ in. beyond the face of the brickwork, and boldly moulded on the bottom edge, splayed for stucco and rebated in parts for window frames. The two timbers to be secured together with 8 in. coach screws every 3 ft. apart.

The sill-piece may be in one 9 in. (7 in. or 11 in.) × 5 in. timber.

6 in. (or 7 in.) × 4 in. twice skew-grooved intermediate (studs or quarters) posts, rebated in parts for window and door frames.

The external angle (corner) posts to be formed of one 9 in. (7 in. or 11 in.) × 4 in., and one 6 in. (4 or 8 in.) × 4 in. timbers, rebated and grooved together and secured with 8 in. coach screws every 2 ft. apart, and boldly stop moulded on the angle.

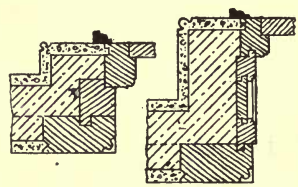
The external angle post may be one 9 in. × 9 in. (7 in. × 7 in. or 11 in. × 11 in.) timber.

The internal angle posts to be formed of two 9 in. (7 in. or 11 in.) × 4 in. timbers, skew-grooved for stucco, and rebated together.

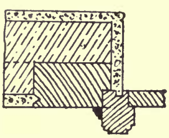
The curved braces to be 4 in. thick, showing 8 in. (7 in., 9 in., or 11 in.) to the weather, and skew-grooved and weathered for stucco. (Describe any straight braces.)

Angle posts to doors to be 9 in. (7 in. or 11 in.) × 4 in. skew-grooved for stucco, rebated for door frames, and boldly stop moulded on the angle.

If the doors be recessed, the angle posts to door frames might be worked similar to the sketches.



If the door frames be on the exterior of the framing, the angle posts would not be moulded on the arris, but rebated out, with perhaps a moulding planted on to cover the joint. In like manner a moulding might be placed round the window frames to cover the joint with the framing.



The head piece to be a 9 in. (7 in. or 11 in.) × 4 in. timber, skew-grooved for stucco, rebated for window and door frames, and secured to the brick backing with 2 in. × $\frac{1}{4}$ in. wrought-iron angle straps every 5 ft. apart, screwed on to the head with two 3 in. screws each and clipped 18 in. down the inner face of the walls.

$1\frac{1}{2}$ in. (or $1\frac{1}{4}$ in.) solid moulded soffit panelling (state width of panels) with a moulding out of 6 in. × 3 in. planted against the ground floor head piece and a small moulding against the first floor sill piece.

Then describe any timber brackets to support the overhanging first floor story.

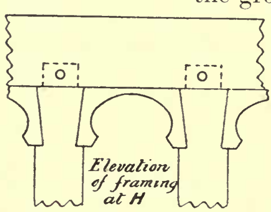
The first floor framing to be (say) 8 ft. total height, projecting (say) 2 ft. 6 in. out beyond the framing below, and consisting of:—

Two 9 in. (or 11 in.) × 4 in. (or 3 in.) timbers as sill piece, boldly moulded on the one (or two) edge, splayed for stucco, and grooved for the weather moulding, and secured together with 8 in. (or 7 in.) coach screws every 3 ft. apart. The inner piece of sill to be mortised out for the tenons of floor joists, and secured to every third floor joist with 2 in. × $\frac{1}{4}$ in. wrought-iron angle brackets, having 9 in. and 18 in. arms, and screwed with 5 in. and 4 in. coach screws to the framing and the joists respectively, every 4 in. apart. Rebate on to the sill piece a weathered and moulded weathering out of 5 in. × $3\frac{1}{2}$ in.

The inner piece of sill is not absolutely necessary, but it allows the outer sill piece to be lower down for effect. In any case a rough timber plate will be required along the tops of the joists, to receive the first floor brickwork if over $4\frac{1}{2}$ in. thick.

7 in. (9 in. or 11 in.) × 4 in. nogging piece (intertie), skew grooved and splayed for stucco, and rebated for window sills.

Then describe the external and internal angle posts, the intermediate posts, head piece and braces similar to the ground floor timber.



The cut and shaped ornamental head pieces below the first floor window sills to be 4 in. thick, 12 in. deep, skew grooved for stucco and housed into framing.

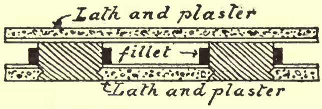
Run 9 in. (or 11 in.) × $1\frac{1}{2}$ in. (or $1\frac{1}{4}$ in.) moulded and splayed fascia board along the head piece, cut in between the rafters.

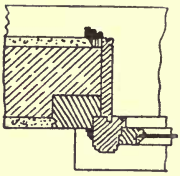
If any of the framing be circular on plan, the sill and head piece must be put together with handrail screws at the joints, or if in two or three thicknesses in depth, then bolted together.

The timbers may be 5 in. thick, or any other size, but timbers over 4 in. thick have to be cut out of balk; see notes to clause No. 4 for sizes of market timbers.

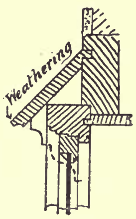
If the framing be in fir timber, it may either be painted or tarred over.

Half-timber framing may be constructed without the brick backing, the timbers in that case should be somewhat thicker. The plastering on the inner side may be secured to laths and battens, or to laths only. The outer stucco or cement work is secured to laths, secured to fillets, spiked to the framing.

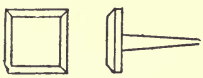




Then describe any barges with pendants, brackets, eaves soffits, eaves boards and cut wrought ends to rafters, see clauses Nos. 87, 88, 86, 85 and 75 respectively. For solid casement windows, see clauses Nos. 170, 171, 173 and 174; and for the glazing, which is often in leaded lights, see Glazier, clause No. 10 and notes. The window sills should be moulded. The sketches show further details of windows.



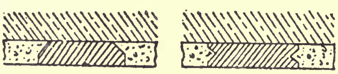
For external doors suitable to this class of work, see clause No. 265. The outside of the doors may be studded with $\frac{7}{8}$ in. square headed wrought or cast-iron nails, spaced 4 in., 5 in. or 6 in. apart, along the rails, styles and braces, either in one or two rows. For overhanging door heads see notes to clause No. 255, page 248.



The cement, stucco, or pebble dash face between the timbers would be similar to clauses Nos. 68 and 65 to 67 in Plasterer. Of course, Portland cement facing makes the best work, as in Plasterer, clause No. 68.

Treenails are cut from $\frac{3}{8}$ in. to $\frac{3}{4}$ in. diameter by 3 in. to 6 in. long, and tapered, they are sometimes required 1 in., $1\frac{1}{4}$ in. and $1\frac{1}{2}$ in. diameters.

Sham half-timber work to existing buildings is formed with framing $1\frac{1}{4}$ in. ($1\frac{1}{2}$ in. or 2 in.) thick, mortised and tenoned together and plugged to walls, with the stucco facing filled in between. It is sometimes called slab work. Oak treenails may be employed to pin the joints together.



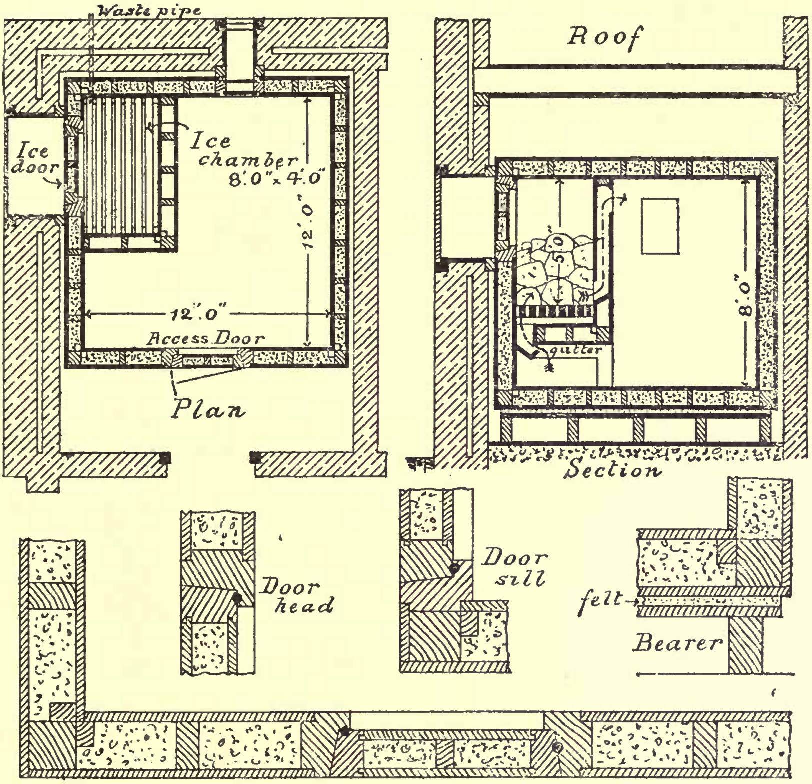
(334)—

Cold store (refrigerator).

(335)—In large establishments an ordinary box refrigerator is not sufficiently large for the requirements of the house.

In this case a separate "cold store room"—that is, a large refrigerator—becomes necessary. It may be formed in the following manner, and placed in a larder or in a separate chamber by itself.

The sides, bottom and top of cold store to be formed with 4 in. × 2 in. fir stud framing placed every 15 in. (to 18 in.) apart, with 4 in. × 4 in. heads, sills and angle posts. Cover both sides of framing with 1 in. wrought one side grooved and tongued V-jointed deal boarding in 3½ in. widths. Fill in between the boarding to all parts with silicate cotton (slag wool) tightly packed.



General Detail of Framing.

The access door to be 3 ft. × 6 ft. 6 in., formed with 4 in. × 3 in. solid framing, packed in with silicate cotton between two thicknesses of similar 1 in. boarding. The top and bottom rails and styles to be bevelled off and grooved out to fit into a 6 in. × 4 in. similar double rebated, bevelled and grooved frame, having a ½ in. indiarubber stop planted all round. Hang door on one pair of 18 in. galvanised iron cup and ball (or strap and pivot) hinges, and allow the p.c. sum of 20s. for a galvanised iron lever fastening, so as to draw the door up tight against the indiarubber stop on the frame.

Form the ice chamber part of the cold store with similar stud framing and boarding, with bearers and leg supports, but without the silicate cotton packing, four 12 in. × 6 in. holes being cut in on one side in the boarding at the bottom, and at the top on the other side. Line the floor and sides with 14 (or 15) gauge sheet zinc, soldered at joints and nailed in parts with zinc nails. Put $2\frac{1}{4}$ in. × $1\frac{1}{2}$ in. wrought fir battens against the vertical sides of ice chamber as a protection to the zinc lining, and screw on with $2\frac{1}{2}$ in. screws every 12 in. apart.

The bearers upon which the ice rests to be in 4 in. × $2\frac{1}{2}$ in. wrought fir placed 2 in. apart, made movable and resting on bearers at either end, with securing blocks at the ends between the spaces.

The gutter beneath the floor of the ice chamber which takes away the melted ice water, to be formed with 1 in. boarding lined with zinc, with an $1\frac{1}{2}$ in. pipe and trap at one end, discharging out into the gully (or channel) near, on the outer side of the cold store compartment.

The door to the ice chamber to be 2 ft. 8 in. × 2 ft. 3 in., formed in a similar way to the access door, and provided with similar ironmongery, and in addition the sill lining is to be protected with a 2 in. × $\frac{1}{4}$ in. wrought-iron bar on the inside. The door in the external wall may be an ordinary door and frame, with cement or deal jamb linings.

The window to be 2 ft. × 1 ft., formed with two thicknesses of $\frac{1}{4}$ in. British polished plate glass, bedded in putty in a 6 in. × 3 in. solid wrought four times rebated deal frame (and perhaps provided on the outside with an ordinary window, and an $1\frac{1}{4}$ in. hinged shutter with fastenings).

For meat hooks and hangers, see clause No. 298.

The cold store to be supported upon 7 in. × 3 in. fir joists (bearers) placed 2 ft. apart, twice tarred all over, and with an 1 in. rough deal floor on top covered with hair felt 1 in. thick.

Paint the boarding on the inside and outside in four coats oil colour (or in enamel paint, or size and twice varnish).

The inside of cold store is not necessarily painted or varnished.

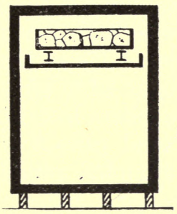
The trap in the waste pipe is to prevent warm air finding its way up the pipe into the ice chamber. The iron bar placed on the sill of the door to the ice chamber is merely to prevent the sill being damaged when throwing in the ice. The arrows on the sketch show the direction the cooled air takes. The colder air descending from the top drives the warmer air up through the ice chamber, whence it is cooled down again and descends in like manner.

As cold descends, the main point in a cold store is to insulate the floor from the ground in such a manner that the escape of cold may be minimised. This is the reason of the tarred bearers and felt seating upon which the cold store rests, the floor being the chief point where any escape takes place.

A cold store may be placed in an ordinary larder, or in a special chamber for its reception in the coolest part of the house, the walls of which should, if possible, be hollow and the roof double.

The sketch shows a fair size cold store suitable for a large private establishment, which will take a couple of small beasts, such as sheep, in addition to the ordinary game, poultry and joints. If more or larger beasts have to be accommodated, the store must be proportionately larger.

If the store be required to take only game, poultry and joints, then a clear area of about 36 super. ft. by 7 ft. high will be sufficient. In this latter case the ice chamber itself may be a galvanised iron box supported on girders (beams) placed near the ceiling of the cold store, but sufficiently clear of the top to allow for getting in the ice. It must be provided with a trap and waste pipe, and a door for access. Condensation will form on the under side of this ice tank, and consequently drops of water will fall on the floor of the store. If this be found objectionable, a zinc-lined wood tray may be placed under the ice tank, with a trap and waste pipe to the outside. The side, top and bottom of the cold store itself would be formed similar to the previous description.



It is somewhat difficult to get a cold chamber to register a temperature below 43° Fahr. One ton of ice will be about sufficient to 400 cub. ft. of cold store room to obtain this degree of cold. A ton of ice thrown in loosely will occupy about 40 cub. ft. of space.

(336)—

(337)—

(338)—

(339)—

Campsheeting and Piling.

(Clauses Nos. 340 to 342.)

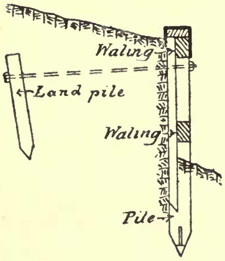
For river walling, see Bricklayer, clause No. 110, and notes preceding clause No. 109 in Bricklayer.

Campsheeting to a river bank.

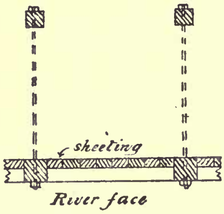
(340)—Cut down the trees from the river bank, grub up the roots and bushes, part excavate bank, part fill in at back of sheeting, and part cart away (or deposit on site, state where).

The campsheeting to the river bank for a distance of (say) 100 ft., with a return piece of (say) 20 ft., to consist of:—

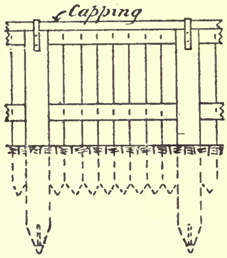
8 in. × 6 in. angle and 6 in. × 6 in. intermediate sawn



English oak main piles, spaced 6 ft. apart in 8 ft. (more or less, according to requirements) average lengths, pointed at feet and shod with cast-iron pointed shoes, having a bearing surface of 3 in. square, with a depth of 6 in. along the central axis, weighing 14 lbs., and fixed to each pile with four $1\frac{1}{2}$ in. $\times$ $\frac{3}{8}$ in. wrought-iron straps 18 in. long, each strap being fixed with three wrought-iron spikes 4 in. long. The piles to be driven into the solid ground 2 ft. 6 in. below the river bed, with a monkey weighing 1 cwt., having a 12 ft. fall. The top ends of piles to be sawn off and tenoned into the capping piece. Tie in the piles with $\frac{5}{8}$ in. wrought-iron tie rods about 12 ft. long, attached with nuts, heads and large washers to 5 in. $\times$ 5 in. (or 6 in. $\times$ 6 in.) Dantzic fir land piles 5 ft. long, let into the ground, and well rammed round and filled in after the tie rods are fixed.



Fill in between the main piles with two 5 in. $\times$ 4 in. Dantzic fir walings spiked on, and drive at the back 2 in. (or 3 in.) close jointed fir planking (sheeting) in 4 ft. (or other) average lengths, wrought on the edges, skew pointed at feet, sawn off at top, and spiked to walings.



Run 9 in. $\times$ 4 in. (or 3 in.) Dantzic fir capping piece along the top, mortised into the tenons of the piles, and secured to the piles with 2 in. $\times$ $\frac{3}{16}$ in. wrought-iron straps, 3 ft. 6 in. long, spiked on with 5 in. spikes, every 6 in. apart.

Twice tar over the faces of all timbers with Stockholm tar.

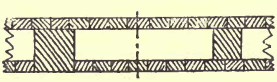
Allow the p.c. sum of £1 per yard for a guard railing, with standards.

State if drop rings be required to any of the piles, secured on with bolts, eyes, nuts and washers, to which boats may be moored.

The timbers may be creosoted, see clause No. 26.

The sheeting may be birdsmouthed together.

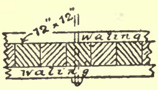
Campsheeting to a river bank is to protect the bank from the swirl of the river.

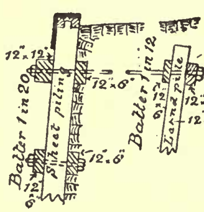


Sometimes sheeting is placed on the face of the piling as well as at the back, so as to present an even surface, and prevent boats catching under the walings.

The timbers may be in pitch pine. See notes to clause No. 342 as to timbers rotting, where subject to tides. Sheet piling may also be constructed as sketches.

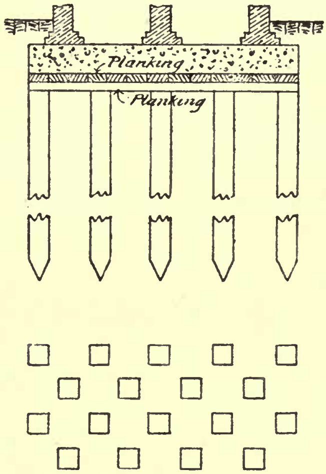
See notes to clause No. 342 on the weight of a monkey.





Piling for foundations.

(341)—The concrete foundations to be carried upon piles in the following manner:—



Drive into ground every 2 ft. apart Dantzic (Baltic) fir timber piles, 12 in. square in 20 ft. (or other) average lengths, until they will drive no further, shoe at the feet with cast-iron pointed pile shoes, each having a bearing surface of 4 in. square, 8 in. deep along the central axis, weighing 25 lbs., and fixed to each pile with four 2 in. × ½ in. wrought-iron straps, 21 in. long, each strap having four ½ in. diameter countersunk holes drilled through and spiked to piles with wrought-iron spikes 5 in. long. The upper ends of piles to be ringed round with 1¾ in. × ½ in. wrought-iron rings for driving. Saw off the tops and lay two thicknesses of 3 in. (or 2½ in.) fir planking as a foundation bed for the concrete.

If piles are creosoted, see clause No. 26.

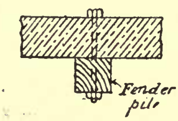
In any position where it is too expensive to excavate bad foundations, such as quicksands and boggy soils, this form of piling may be employed.

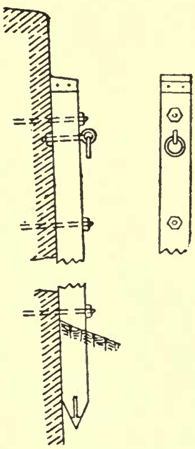
See Excavator, clause No. 10, for piling round a space which is excavated out afterwards. See Bricklayer, clause No. 110, and notes for land piles and sheet piling to river walls. See Bricklayer, clause No. 115, for piling to chimney shafts. The piles may be in oak or pitch pine.

See notes to clause No. 342 on weight of monkey.

Piling in front of river walls (fender piles).

(342)—Fender piles may be driven about every 6 to 10 ft. apart in front of river walls to protect them from barges.



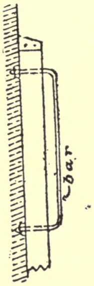


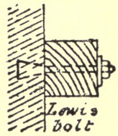
The description of the piles would be similar to clause No. 341, and in addition state that the tops are to be capped in cast-iron ½ in. (to ¾ in.) metal, screwed on with two screws on each face, through countersunk holes. Tie in each pile to the river walling with ¾ in. wrought-iron bolts, nuts, heads and large washers, placed every 5 ft. apart, and provide each pile with a 4 in. diameter wrought-iron drop ring, ½ in. metal, fixed to the pile with a bolt, nut, eye and washer.

If piles are creosoted, see clause No. 26; they may also be in oak or pitch pine. That part of a pile which is subject alternately to wet and dry is soon liable to rot. It is essential in this case to either creosote or tar the timbers.

Sometimes an 1 in. (to $1\frac{1}{4}$ in.) wrought-iron bar is fixed to the piles for attaching the ropes of barges to in lieu of the drop rings.

When fender piles are renewed to an existing wall, they are fixed with lewis bolts.





Piles 10 in. to 14 in. square require for driving a monkey weighing from 12 cwt. to 18 cwt., according to the circumstances of the case. In like manner, sheet piles 9 in. × 3 in. require a monkey weighing from 5 cwt. to 8 cwt.

SMITH AND FOUNDER.

Wrought iron (that is, almost pure iron) contains from about ·15 to ·25 per cent. of carbon.

Steel contains from about ·12 to 1·5 (or 1·8) per cent. of carbon.

Cast iron contains from about 2 to 6 per cent. of carbon.

Cast iron is mostly employed for columns, stanchions and cantilevers.

Wrought iron is mostly used for girders, stanchions, and roofs.

Steel may be employed in all situations.

Malleable cast iron contains less carbon than ordinary cast iron, thereby giving it a toughness. It is very suitable for small castings.

Wrought iron	1 in. thick	weighs about	40·32	lbs.	per foot	super.
Cast iron	„	„	37·50	„		„
Steel	„	„	40·8	„		„

Wrought iron in plates, bars, tees and angles.

(1)—The wrought iron in plates, bars, tees and angles to be of Best Best South Staffordshire (or other quality approved by the architect) iron, free from cracks, blisters, flaws and other imperfections, with the edges sound and true, and equal to a tensile stress of 20 tons per square inch of section, with a reduction of area at fracture of not less than 10 (or 20) per cent.

Specimens of the wrought iron intended to be used, will be taken by the architect, and sent for testing either to Kirkaldy's works, or the London University, and either of their reports will be taken as correct; all expenses incurred in so doing shall be borne by the contractor.

Portions of the iron may also be taken by the architect from the work when fixed and subjected to similar tests, the expense being borne by the contractor.

Rolled iron and steel joists.

(2)—The rolled iron and steel joists to be of English manufacture.

All joists and girders to be set with a camber of 1 in. (to 2 in.) in 40 ft.

Planing to plates and bars.

(3)—The plates and bars to be truly straight, and bent to the exact forms required, and the ends planed so as to form true joints.

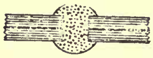
Wrought iron in rivets, bolts, nuts and straps.

(4)—The rivets, bolts, nuts and straps to be best Lowmoor (or S.C. crown) iron.

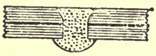
Rivet iron especially.

Rivet iron to be equal to a tensile stress of 22 tons per square inch of section, with a reduction of area at fracture of not less than 20 per cent.

Rivet and bolt holes.



Snap Rivet



Countersunk Rivet

The rivet and bolt holes to be drilled (or rimed) out to the exact diameters required, and burrs cleaned off, and set out to correspond exactly with the opposite holes in other parts to which the rivets and bolts have to be connected, and countersunk where required, the countersinking being concentric.

Riveting.

The rivets to be firmly driven so as to completely fill the holes, and the heads to be neatly finished off.

Bolts, nuts and washers.

(**5**)—The bolts to be screwed to Whitworth's threads the exact diameters required, and projecting two full threads beyond the nuts, and supplied with hexagon heads and perfectly fitting hexagon nuts, and with washers where required.

Bolts are made $\frac{3}{8}$ in., $\frac{1}{2}$ in., $\frac{5}{8}$ in., $\frac{3}{4}$ in., 1 in., $1\frac{1}{4}$ in., $1\frac{1}{2}$ in. and 2 in. diameters.

Forged work.

(**6**)—The smith's work to be forged clean from the anvil, with flatters, swayes and rounding tools, and neatly chamfered off on the edges, or evenly diminished, as the case may be. All welds, turns, or setts to be sound.

Dip straps and bolts in linseed oil.

(**7**)—The straps and bolts to roofs, bressummers, partitions and girders to be heated to a blue heat, and struck over with linseed oil.

Also see Carpenter, clause No. 74.

Steel.

(**8**)—The steel to be capable of standing a tensile stress of 30 tons per square inch of section, with 20 per cent. elongation in a length of 8 inches.

Steel is 30 to 40 per cent. stronger than iron.

Cast iron.

(**9**)—The cast iron to be from the best quality tough grey pigs. The castings to be sharp and of the exact form required, and shaped to fit the parts truly, and holding full dimensions, and to be entirely free from air holes, scoriae, core nails, flaws, and defects of every kind, and to be painted one coat in oil colour before leaving the foundry.

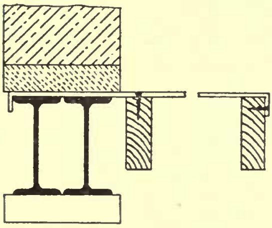
Holes to be drilled in the hollow columns for testing the thickness of the metal, at the contractor's expense, and filled up afterwards. Salt water or sea sand is not to be used in the castings.

Planing to columns and stanchions.

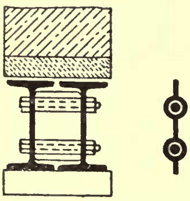
(**10**)—The heads and bases of all columns and stanchions to be planed perfectly level.

Rolled iron or steel joists and girders over openings.

(**11**)—Carry the wall above opening on ground floor upon two 12 in. × 6 in. (or other size) rolled iron (or steel) joists, bearing 9 in. (or 12 in.) on walls at either end, with 4 lb. lead (or felt) seatings and 18 in. × 18 in. × 3 in. (2½ in. or 4 in.) tooled hard York templates under, and 18 in. × 3 in. (2½ in. or 4 in.) tooled hard York cover stones in cement above in lengths of not less than 5 ft., and cramped at joints with 8 in. galvanised iron (or copper) cramps. Tie in the iron joists to the floor joists every 5 ft. apart, with 3 in. × ½ in. bar irons 6 ft. long, sunk into the cover stones and turned down 3 in. at either end to catch the iron and wood joists respectively, and screwed on to each of the floor joists with 3 in. countersunk screws. The joists to be free at the ends to allow for expansion of, say ¼ in. to every 10 ft. span. Paint the joists one coat in oil colour before fixing, and two coats after fixing.



When two or more single rolled iron or steel joists are placed side by side, they may be secured together with ¾ in. bolts, nuts and heads with ¾ in. metal, cast iron (or plain barrel tubing) spacing pieces placed between the joists.



The iron tie bars are not always absolutely required, but if the floor joists run at right angles to the iron joists, they then become more necessary, and would only require to be turned down at the one end.

For cover stones, see Mason, clause No. 39; and Plumber, clause No. 20, for the lead seating.

Rolled iron or steel joists may be used from 3 in. up to 12 in. or 14 in. deep; beyond that depth built up riveted girders are better.

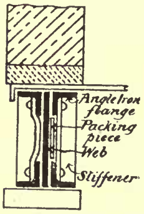
Where the ends of girders come over a door, window, or other opening within a short distance of the head, it is essential to put an iron or steel lintel under to receive them, see clause No. 17.

The safe load on wrought-iron girders should not exceed one-fourth the breaking weight.

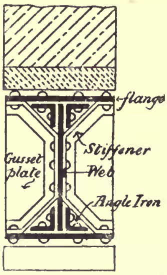
Wrought-iron girders may take a safe load of 5 tons per sq. in. tensile, 4 tons compressive, and 4 tons shearing stress.

Steel girders will take a safe load of 7 tons per sq. in. tensile, 7 tons compressive, and 5½ tons shearing stress.

If a riveted wrought-iron (or steel) plate girder be used, give the thickness and depth of the web, the size and thickness of the angle irons, flanges, stiffeners and packing pieces, and state that they are to be riveted together with rivets 3 in. (4 in. to 6 in.) apart. Then describe the seatings, templates, cover stone, tying-in irons and painting; and state that the rivet heads are to be packed up flush with neat cement, to take the cover stones, see Mason, clause No. 39.

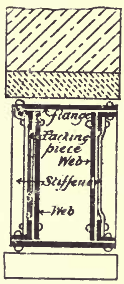


If a riveted wrought-iron (or steel) flange girder be used, give the sizes of all its parts, such as web, angle irons, T-iron stiffeners, gusset pieces, flanges and cover plates. Then describe the seatings, templates, cover stone, tying-in irons and painting, and state that the rivet heads are to be packed up flush in neat cement to take the cover stone, see Mason, clause No. 39. Gusset pieces are vertical plates placed between the flanges at right angles to the web.



These two classes of plate girders may be used up to 50 ft. span, the depth of web may be from a $\frac{1}{10}$th to $\frac{1}{12}$th or $\frac{1}{15}$th the span, but if less, the girder is liable to deflect, $\frac{1}{12}$th the span being the usual depth. The width of flange is generally from $\frac{1}{30}$th to $\frac{1}{40}$th the span.

If a riveted wrought-iron (or steel) box girder be used, give the sizes of all its parts, such as the webs, angle irons, T-iron stiffeners, packing pieces, flanges and cover plates. Then describe the seatings, templates, cover stone, tying-in irons, painting, and the cement packing, as in Mason, clause No. 39.



If a riveted wrought-iron (or steel) lattice or warren girder be used, give the sizes of all its parts, with the seatings, templates, cover stone, tying-in irons, painting; and cement packing, as in Mason, clause No. 39.

Rolled iron or steel joists as carriages to stairs.

(**12**)—The wood (or stone) principal staircase to have two 8 in. × 4 in. (or other size) rolled iron (or steel) joist carriages to each flight, bent at angles (or mitred together at angles with planed joints, and secured with $\frac{3}{8}$ in. (or $\frac{1}{2}$ in.) wrought-iron fish plates, covering the joints for 6 in. each way, and bolted together with four $\frac{5}{8}$ in. bolts, nuts and heads), and built into walls 9 in. on 18 in. × 9 in. × 3 in. tooled hard York templates, with 4 lb. lead (or felt) seatings.

For sketches and positions of carriages, see Carpenter, notes to clause No. 221, Mason, notes to clauses Nos. 64 and 71; and for the lead seatings, see Plumber, clause No. 20.

If the span for the carriages be great, and the required depth of the joists cannot be obtained on account of head room, then hanging rods may be employed to support the wood stairs from the strings, by slinging the rods up to some support above. The rods might be 1 in., $1\frac{1}{4}$ in., or $1\frac{1}{2}$ in. diameter, with nuts, heads and washers.

Rolled iron or steel joists as carriages to concrete stairs.

(13)—See preceding clause, No. 12, and notes to clause No. 42, under Excavator.

Rolled iron or steel joists to landings.

(14)—The landing on (say) second floor to be supported at the nosing upon a 10 in. × 5 in. (or other size) rolled iron (or steel) joist, built 9 in. at either end into walls on 18 in. × 12 in. × 3 in. tooled hard York templates, with 4 lb. lead (or felt) seatings.

For sketch of this landing joist see Mason, notes to clause No. 64; and for the lead seating, see Plumber, clause No. 20.

Rolled iron or steel joists to fire-resisting floors, flats or terraces.

(15)—The ironwork to the concrete floors to be composed of 8 in. × 4 in. (or other size) rolled iron (or steel) joists placed 2 ft. 6 in. apart, bearing on walls 6 in. (or 9 in.) at either end on 9 in. (or 12 in.) × 3 in. (or $2\frac{1}{2}$ in.) tooled hard York stone templates running along the whole length of the walls. (Describe the size of the joists according to the various spans, together with any cross girders supporting the joists; see clauses Nos. 41, 45 and 46, under Excavator.)

For sketches of fire-resisting floors, see Excavator, clauses Nos. 41 to 46.

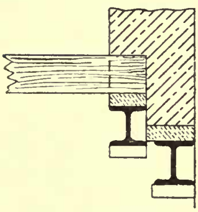
The joists may be placed more than 2 ft. 6 in. apart, if smaller joists or T-irons are placed in between at about 2 ft. 6 in. apart.

State if any iron or steel lintels are required over openings, to carry the ends of the joists; see clause No. 17.

Rolled iron or steel joists to wood floors.

(16)—See the example given in the notes to clause No. 53 in Carpenter; and see Plumber, clause No. 20, for the lead seatings.

Iron or steel lintels.



(17)—The external lintels to windows to be 5 in. × $4\frac{1}{2}$ in. (or other size) rolled iron (or steel) joists, bearing 9 in. on walls at either end on 12 in. × 9 in. × 3 in. tooled hard York templates, with 6 in. × 3 in. tooled hard York cover stones on top in cement. The internal lintels carrying the floor joists to be 8 in. × 4 in. (or other size) rolled iron (or steel) joists with stone templates (but perhaps no cover stones).

Iron or steel lintels are often required in warehouses or factories to take the weight of the floors; they are also useful over window or other openings which may be of too great a span for an arch to carry.

Wrought-iron or steel flitch plates and bolts.

(**18**)—See notes to, and clause No. 124 in Carpenter.

Wood bressummers, as mentioned in Carpenter, clause No. 44, often have a wrought-iron or steel flitch plate between them for strength, when supporting walls or floors above. A rolled iron or steel joist may be employed between the timbers of the bressummer in lieu of the flitch plate.

The safe load on flitch bressummers should not exceed $\frac{1}{5}$th the breaking weight. The flitch plate should be from $\frac{1}{10}$th to $\frac{1}{12}$th the thickness of the bressummer.

Strap iron and bolts to roofs and partitions.

(**19**)—Allow $\frac{1}{2}$ cwt. per square to wood studded partitions; and $\frac{1}{2}$ cwt. to each roof truss, of fixed wrought forged strap iron, bolts, nuts, heads, washers, plates, hanging straps, or rods.

Also see Carpenter, clauses Nos. 74 and 136 respectively, for straps to roofs and partitions. Straps to roofs and partitions are generally 1 in. $\times \frac{3}{16}$ in., $1\frac{1}{2}$ in. $\times \frac{5}{16}$ in., or 2 in. $\times \frac{3}{8}$ in.

Holding down irons to cornice.

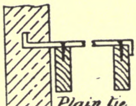
(**20**)—See Mason, notes to clause No. 104.

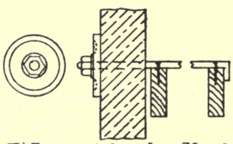
Iron tie rods to hearths and floors.

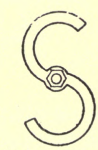
(**21**)—See Carpenter, clauses Nos. 47 and 53, and Excavator, clauses Nos. 43 and 44.

Iron tie rods to walls.

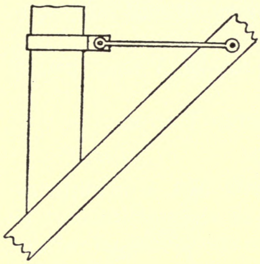
(**22**)—When the walls of a building run up to some height without being tied in by the floor joists, it is well to tie them in to the floor joists, either with similar straps as described in clause No. 11, but built into the walls; or else with similar straps going right through the wall, but formed at the wall ends into a circular rod with screwed threads, and secured on the outside with nuts to a 1 in. metal cast-iron plate 9 in. (to 12 in.) diameter (or else to a wrought S-iron, 3 in. $\times \frac{1}{2}$ in. metal, about 2 ft. long, 12 in. wide).


Plain tie Iron


Tie Iron with Cast Iron Head


S Iron Head to Tie

Iron ties to chimney stacks.



(23)—When a chimney stack is insecure, a band of $3 \times \frac{1}{2}$ in. wrought iron is generally placed round the stack, secured together with a bolt, nut and head; and from which an 1 in. (or $1\frac{1}{4}$ in.) iron rod with flattened ends is attached and taken and secured to the roof timbers with a bolt, nut and head with washers. Of course, it is the better plan to rebuild the stack securely.

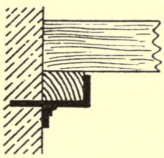
Iron chimney bars.

(24)—See Bricklayer, clause No. 50.

Hoop iron.

(25)—See Bricklayer, clause No. 66, and Carpenter, clause No. 61.

Iron corbels.



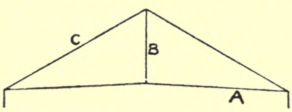
(26)—Carry the wall plates on cast-iron corbels every 3 ft. apart, $\frac{3}{4}$ in. metal, 4 in. wide on face, and built 9 in. into walls.

In London and certain other districts, timber joists are not allowed to be bedded in party walls within a certain distance from the centre; in such cases iron or stone corbels or brick set offs become necessary. For stone corbels, see Mason, clause No. 32.

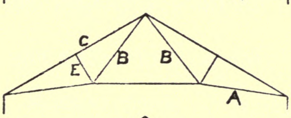
Iron roofs.

(27)—Iron roofs are constructed mainly upon the same principles as timber roofs. The sizes of the various parts can be obtained from any of the architects' pocket books.

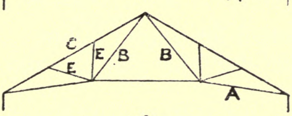
Here are some of the forms mostly used:—



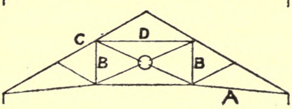
Suitable for spans up to 20 ft.



Suitable for spans up to 30 ft.



Suitable for spans up to 40 ft.



Suitable for spans up to 40 ft.

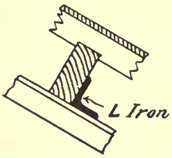
For greater spans the construction becomes more elaborate.

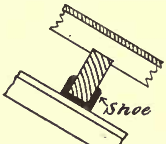
The tie bolts A are of circular rod iron, fitting into cast-iron chairs.

The king and queen bolts B are of circular rod iron, fitting into cast-iron head-pieces.

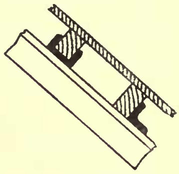
The principal rafters C, and straining piece D, are of T-iron, fitting into the head piece, and chairs.

The struts E are of angle iron, T-iron, or of double T-iron.





The purlins may be in L-iron supporting timber purlins, or the purlins may be in timber, secured to the principal rafters, with cast-iron shoes.

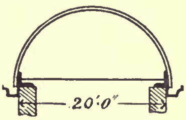


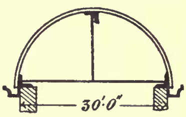
The purlins, when placed near together, may take the place of the common rafters, which in some cases may be found advantageous.

The ridge and common rafters are of timber.

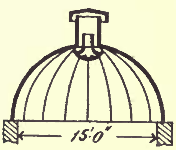
The coverings and other parts to the roofs may be similar to those used for timber roofs.

Arched roofs up to 20 ft. span may be formed with corrugated iron sheeting riveted together, and secured to angle irons at the springing, and with tie rods 12 ft. apart to take the thrust. Up to 30 ft. span they may be formed in a similar way with $\frac{5}{8}$ in. diameter king bolts 6 ft. apart, $\frac{3}{4}$ in. diameter tie rods, $1\frac{1}{2}$ in. $\times 1\frac{1}{2} \times \frac{3}{8}$ L or T-iron ridge ties, and $2\frac{1}{2}$ in. $\times 2\frac{1}{2}$ in. $\times \frac{3}{8}$ L-irons at eaves.





Iron domes and skylights.



(28)—Small domed skylights are formed with bent wrought T-iron, or bent moulded wrought bar iron

riveted to a sole and crown piece

The description for a dome 10 ft. or 15 ft. span might run:—

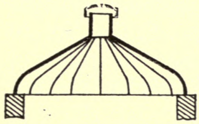
Form dome skylight over principal staircase with 2 in. $\times 1\frac{1}{4}$ in. wrought-iron moulded bars placed 18 in. (to 2 ft.) apart at the springing, riveted to a half bar sole piece at the foot, and to a moulded L-shaped bar crown piece at the top.

Allow the p.c. sum of £8 for a ventilating sun burner.

See clause No. 69 for painting to iron bars when for glazed lights.

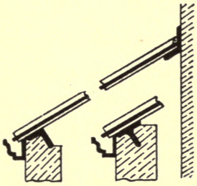
Also see notes to clause No. 15 in Glazier for the glazing, and various forms of iron dome skylights.

The ventilating shaft may be formed in No. 16 B.W.G. galvanised sheet iron 18 in. to 2 ft. 6 in. diameter, with the hood covering over bolted on, and provided with a flap inside the shaft, worked with gearing from the landing below.



Here is another form of iron skylight, with partly straight, and partly bent bars.

Lean-to.

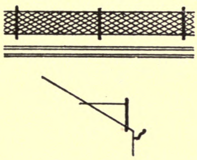


(**29**)—A "lean-to" iron skylight may be formed with similar **T**-iron or moulded bars, as in clause No. 28, and riveted to a **T** or **L**-iron piece at the eaves, and to an **L**-iron or moulded bar at the top.

A span iron skylight might have a **T**-iron or a plain bar iron ridge, with an **L** or **T**-iron piece at the eaves.

For painting to glazed iron lights, see clause No. 69.
For skylights in wood, see Carpenter, clauses Nos. 124 to 127, 129 to 131, 134 and 134a.

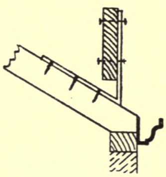
Snow guards.



(**30**)—Fix to eaves of roof where overhanging the conservatory (or skylights), movable, strong, galvanised iron wire netted work snow guards, 9 in. high, fitted into eyes formed in $\frac{1}{2}$ in. rod iron standards, placed every 5 ft. apart, and secured to roof with $\frac{3}{8}$ in. iron rod stays.

Snow guards are a protection against snow falling from the roof, and damaging any glass below.

The snow guards (or boards) may be in 7 in. × 1 in. (or $1\frac{1}{4}$ in.) wrought deal, secured with $\frac{1}{2}$ in. bolts, nuts and heads, to 2 in. × $\frac{3}{8}$ in. strap irons, spaced every 3 ft. to 4 ft. 6 in. apart, secured to the roof with 3 in. brass screws.



For skylight guards, see clause No. 31.
For snow boards to roof gutters, see Carpenter, clause No. 89.

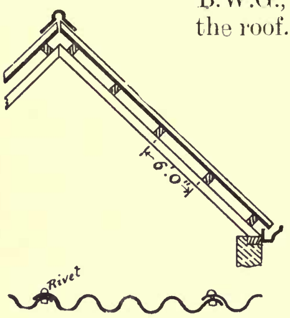
Skylight guards (shields).

(**31**)—Cover the top surface of the skylights with strong galvanised iron wire netting, bound to rod iron framing, and made movable.

These guards are placed over skylights where they are liable to damage from snow falling from a roof, or from falling articles.
For snow guards, see clause No. 30. For snow boards to roof gutters, see Carpenter, clause No. 89.

Galvanised corrugated iron roofing.

(32)—Cover the outbuildings with galvanised corrugated iron sheets having 5 in. (or 3 in.) flutes, No. 16 B.W.G., the flutes running parallel with the pitch of the roof. Each sheet to break joint and overlap another 6 in. in the horizontal joint, and the full width of one corrugation in the vertical joint. The vertical joints to be riveted together with $\frac{3}{4}$ in. $\times$ $\frac{5}{16}$ in. diameter galvanised iron cone-headed rivets and washers 6 in. apart, and the horizontal joints to be double riveted together with similar rivets and washers 6 in. apart, and the sheeting screwed to the timber framing with 2 in. $\times$ $\frac{5}{16}$ in. diameter galvanised iron cone-headed screws 6 in. apart. Finish the ridge with galvanised iron ridge capping 15 in. (or 18 in.) girth, screwed on to the ridge with similar cone-headed screws and washers.



If to a "lean-to" roof, then describe a flashing piece.

The roof timbers to which the sheeting is attached are placed 6 ft. apart.

It makes a very neat finish to bend the sheets over the ridge.

About 3 lbs. of rivets are required per square of roofing.

Corrugated iron sheets are made in the following thicknesses, in sizes 5 ft. to 8 ft. long by 2 ft. 3 in. and 2 ft. 9 in. out to out wide, with 3 in. and 5 in. corrugations, and thus reducing the sheets when laid to 2 ft. and 2 ft. 6 in. net widths.

No.	16	B.W.G.	(about $\frac{1}{16}$ in. thick).
„	17	„	
„	18	„	
„	19	„	
„	20	„	(about $\frac{1}{28}$ in. thick).
„	21	„	
„	22	„	
„	23	„	
„	24	„	
„	26	„	

Nos. 16, 17, 18 and 19 B.W.G. are generally made with 5 in. flutes, and Nos. 20 to 26 B.W.G. with 3 in. flutes.

No. 16 B.W.G. is used in good class work; Nos. 17 to 19 B.W.G. in ordinary work; and Nos. 20 to 26 for poorer work.

Corrugated iron is mostly used in movable buildings and temporary structures.

The "pitch" of a corrugated iron roof may be as low as 4°, or one-twenty-ninth of the span.

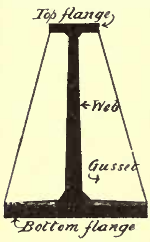
In an arched roof the description would remain the same as to a pitched roof, but instead of securing the sheets to the timber framings (there being none), state that the eaves are to be secured with $\frac{1}{4}$ in. $\times$ $\frac{3}{4}$ in. (or 1 in.) galvanised iron bolts, heads, nuts and washers every 6 in. apart to the eaves gutters, or to the L-iron angle plates. See sketches in notes to clause No. 27.

Sheet-iron roofing.

(**33**)—Plain sheet iron is not much used as a roof covering. It is laid with the horizontal joints lapping, and the vertical joints are dressed over wood rolls and screwed down. The pitch may be as little as 4°.

Sheet iron is made in thicknesses from 12 B.W.G. to 28 B.W.G.

Cast-iron girder.



(**34**)—Cast-iron girders are seldom now used. The best section is as shown in sketch, having the bottom flange six times the area of the top flange (sometimes made as little as only three or four times the area). The web should diminish from the thickness of the bottom flange to that of the top flange. The depth is usually one-twelfth to one-tenth of the span. Gusset pieces or stiffeners are placed every 4 ft. to 5 ft. apart.

Give the sizes of all the parts. Describe the stone template and cover stones as in clause No. 11. The iron should be painted one coat before it leaves the foundry.

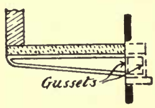
The width of the bottom or tension flange may be one-half to two-thirds the depth of the girder, and the thickness from one-sixth to one-eighth of the width.

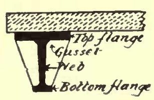
Cast-iron girders will take a safe working stress of 8 tons per square inch in compression, $1\frac{1}{2}$ tons in tension, and 2 tons shearing.

The safe load on cast-iron girders should not exceed one-fifth to one-sixth the breaking weight.

There should be no sudden changes in thickness of the metal, thus, metal 1 in. thick meeting metal 2 in. thick should be eased towards it gradually. The ends of cast-iron girders should be left free. The bottom flange is in tension and the upper flange in compression.

Cast-iron cantilevers (or brackets).





(**35**)—A cast-iron cantilever should have the same proportions as a cast-iron girder, but the wider flange is placed at the top, as with a cantilever the top flange is in tension and the bottom flange in compression.

A description may run:—

The stone landing carrying bay window on first floor to be supported upon two cast-iron cantilevers (give the sizes of the parts or the weights), cut and pinned into wall in cement on 4 in. × 9 in. × 18 in. tooled hard York templates. (See Mason, under clause No. 32, for the landing.) The ironwork is to be painted one coat in oil colour before it leaves the foundry.

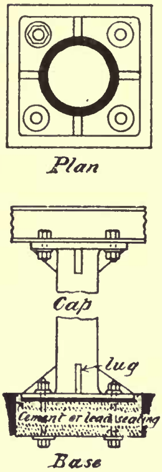
State if a small rolled iron or steel joist be placed under the front edge of the landing and bolted at the ends to the cantilevers with angle plates.

Cantilevers to stairs.

The staircase to be supported on cast-iron cantilevers every 5 ft. apart (give the sizes of the parts or the weight) with the ends cut and pinned into walls on stone templates.

For sketch and positions where these cantilevers are required, see Carpenter, notes to clause No. 221.

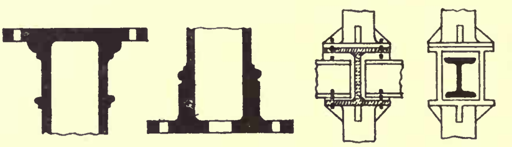
Cast-iron columns.



(36)—Each of the three (more or less) hollow columns on ground floor to be in cast iron $1\frac{1}{4}$ in. (or other thickness) metal, 8 in. (or other size) external diameter at the base, tapering to 7 in. (or other size) external diameter at the top, with 13 in. × 13 in. × $1\frac{1}{4}$ in. (or other size) planed top plate, and 18 in. × 18 in. × $1\frac{1}{4}$ in. (or other size) planed bottom plate cast on the shaft, with four $1\frac{1}{4}$ in. (or other size) projecting lugs to both positions. Where the shaft meets the top and bottom plates it is to be eased out in the metal. Bed the bottom plate in neat cement (or on 10 lb. lead seating) into a (say) 2 ft. 6 in. × 2 ft. 6 in. × 1 ft. 6 in. Scotgate Ash tooled (or rubbed) stone base, secured with four $1\frac{1}{4}$ in. (or $\frac{1}{8}$ in.) diameter holding down bolts (or lewis bolts), nuts and heads, and 4 in. × 4 in. × $\frac{3}{8}$ in. wrought-iron washers on the underside. (Also see Mason, clause No. 40, for stone base.) The top plate to be bolted to the girder with four $\frac{3}{4}$ in. (or other size) bolts, heads and nuts. The ironwork round the bolt holes to be slightly raised as a seating for the bolts. Paint the columns one coat in oil colour before they leave the foundry.

For lead seating, see Plumber, clause No. 20.

State if the caps and bases are moulded, also if there be iron standards (stiffeners) cast on at the heads to receive the bases of any columns above.

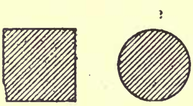


Molded Cap and Base *Cast Standards to Cap*

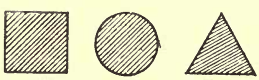
The safe load on cast-iron columns is one-tenth the breaking weight, but if the metal be extremely good then one-sixth is safe. The height should not exceed 25 to 30 times the least diameter, but 20 times the diameter makes a very stiff column.

The thickness of metal should not be less than one-twelfth to one-sixteenth the external diameter, but nothing less than $\frac{3}{4}$ in. metal should be used.

A long solid square cast-iron column is 60 per cent. stronger than a solid circular column, when the side of the square column is the same as the diameter of the circular column.



The strengths of long solid square, circular and triangular columns are relatively in the propor-itons of 110, 100 and 93 respectively.

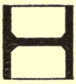


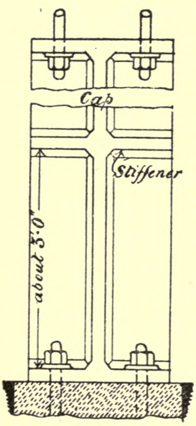
Cast-iron Stanchions.

(**37**)—Cast-iron stanchions should always have equal sides thus; the side A must equal the side B.

The safe load to put on cast-iron stanchions is one-tenth the breaking weight, but if the metal be extremely good then one-sixth is safe.

The thickness of the metal to the arms should be one-sixth to one-eighth the width. The height should not exceed from 25 to 30 diameters, but 20 diameters in height makes a very stiff stanchion.

The strongest form of cast-iron stanchion is  section, which is almost equal to a circular column  of equal area of metal. An  stanchion is only 75 per cent. as strong as a circular  column of equal area of metal.

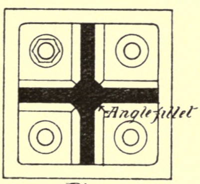


Base

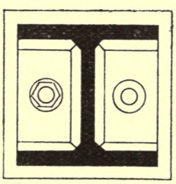
The arms of cast-iron stanchions should be strengthened with angle fillets, and the metal round the bolt-holes should be raised up as a seating for the bolts. Stiffeners are placed about every 3 ft. apart up the stanchion.

The description of a cast-iron stanchion would be somewhat similar to that of a cast-iron column, see clause No. 36.

Give the thickness and width of the arms, the size and thickness of the iron base, the bolts, and the stone base; the thickness of the stiffeners, the size and thickness of the top plate or cap, and the bolts; also the thickness of the standards on top of the cap to take the base of the stanchion above, should a girder run in between.



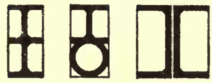
Plan



Alternate Stanchion

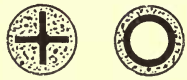
Mention the planing to the base and the cap, and the painting to the stanchion before it leaves the foundry.

Here are some other forms of cast-iron stanchions.



Cast-iron stanchions  section are a waste of material, as the strength of the whole is that of its weakest part.

Cast-iron or wrought-iron columns, and stanchions, may be filled round in fine concrete or plaster as a protection against fire.



Wrought-iron columns and stanchions.

(38)—Here are some forms of wrought-iron columns and stanchions.

The height in proportion to the diameter should be the same as if in cast-iron, see clauses Nos. 36 and 37.

Ordinary rolled iron joists and girders are now much used as stanchions.

Steel columns and stanchions.

(39)—May be formed in the same way as in cast or wrought iron, see clauses Nos. 36 to 38.

Ordinary steel joists and girgers are now much used as stanchions.

Air bricks.

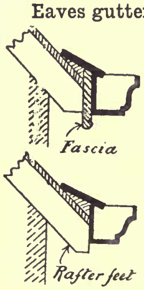
(40)—Put where directed for ventilation under floors (say) twenty 9 in. × 6 in. cast-iron air bricks, form flues to same, and render in cement.

See Bricklayer, clause No. 58.

Describe any other air bricks for air inlets or air exhausts to rooms, see Carpenter, clause No. 148, and Bricklayer, clauses Nos. 56 and 57.

Cast-iron air bricks are made 9 in. × 3 in., 9 in. × 6 in., 9 in. × 9 in., 9 in. × 12 in., 12 in. × 12 in. and 18 in. × 12 in., and may be placed about 10 ft. apart for ventilation under floor.

Eaves gutter.

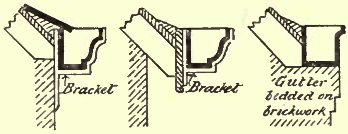


(41)—Roofs and flats to have 5 in. × 4 in. heavy cast-iron (or galvanised cast-iron) ogee (or moulded) eaves gutters, painted three times in oil colour inside and out, with cast nozzles, cast stopped ends, cast angles and other pieces, bolted (or riveted) together (or bolted or riveted together with clips), in red-lead cement, screwed to fascia (or feet of rafters), to falls.

Put galvanised-iron (or copper) wire roses over outlets.

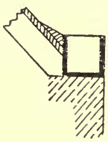
State if half-round gutters or ornamental moulded gutters be required: if with cresting, or with "lion-head" or other ornaments every 3 ft. apart.

The gutters may also be fixed on brackets every 3 ft. apart, secured to walls, or screwed to fascias. State if gutters are screwed to feet of rafters, bedded on brickwork and blocked up to falls.



Half-round eaves gutters are made 3 in., $3\frac{1}{2}$ in., 4 in., $4\frac{1}{2}$ in., 5 in. and 6 in. wide and other sizes, and fixed on hooks or brackets secured to walls or fascia.

Moulded eaves gutters are made in 3 in. × $3\frac{1}{2}$ in., 4 in. × $4\frac{1}{2}$ in., 5 in. × 4 in., 5 in. × 6 in. and other sizes.

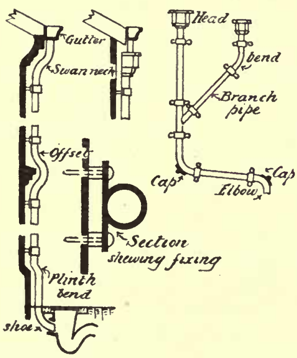


Square eaves gutters are made in 6 in. × 3 in., 5 in. × 4 in., 6 in. × 4 in., $6\frac{1}{2}$ in. × 6 in. and 9 in. × 6 in. and other sizes, and are useful for fixing flush with the face of boundary or other walls.

Iron box-gutters are used in roofs, in various sizes, bolted together in a similar way to eaves gutters.

Rain-water piping.

(42)—Carry down from eaves gutters to gullies below six (more or less) 3 in. (or 4 in.) diameter heavy cast-iron (or galvanised cast-iron) rain-water pipes, with socket joints and ears cast on, plugged and secured to walls with rose-headed galvanised-iron nails, and jointed with gaskin (yarn) and red lead cement (or with patent metal cement). Put all swan-necks, offsets, elbows, plinth-bends, shoes, branches and other connections. The pipes to be kept 1 in. clear from the walls with small pieces of gas tubing (or patent clearing pieces may be used).



Put ornamental rain-water heads to the valleys and box-gutters, p.c. 15s. each, with galvanised-iron wire (or copper) gratings on top.

Rain-water pipes should be as straight and free from bends as possible.

State if ornamental rain-water pipes be required: if of square section; if fixed with loose ornamental bands instead of ears. When rain-water piping runs almost horizontally along a wall, a cap should be described to the elbows for cleaning.

Circular rain-water pipes are made 2 in., $2\frac{1}{2}$ in., 3 in., $3\frac{1}{2}$ in., 4 in., $4\frac{1}{2}$ in. and 5 in. diameters, and other sizes.

Square rain-water pipes are made 3 in. × $2\frac{1}{2}$ in., $3\frac{1}{2}$ in. × $2\frac{1}{2}$ in., 4 in. × 2 in., 4 in. × 3 in., 4 in. × 4 in., 5 in. × 4 in., 6 in. × 4 in. and other sizes.

For a rain-water pipe discharging over a rain-water butt or galvanised iron cistern, see Plumber, clause No. 62.

When rain water is collected into a rain-water well or tank, see Drainage, clause No. 53; if through a filter, see Bricklayer, clause No. 114.

Railing and gate in a garden wall.

(43)—See Bricklayer, clause No. 99.

Area vertical railings.

(44)—These may be in wrought or cast iron (wrought iron being preferable), plain or ornamental. Either give a p.c. sum, or describe fully the rails, bars and standards; and state the vertical bars or standards are to be let into the stone kerb and run in with lead, and that the horizontal rails are to be cut and pinned into walls. Mention the foot stays or spurs.

For sketches and stone kerb, see Mason, clause No. 50.

Area gratings.

(45)—May be in wrought or cast iron (wrought iron being preferable). State size of bars and frame, and that the ends are let into the stone kerb and walls. The kerbs to be 9 in. × 4 in. (or 5 in.) tooled (or rubbed) hard York, in lengths of not less than 5 ft., set and jointed in cement, dowelled at joints, and ends let 6 in. into walls, with 4 in. × $\frac{1}{2}$ in. sawn (or rubbed) slate creasing under.

Also see Mason, clause No. 50.

Plain railing to entrance or garden steps.

(46)—Form railing with 1 in. wrought square bar balusters 5 in. apart, let into mortises in stone and run in with lead, with a $2\frac{1}{2}$ in. × $\frac{1}{2}$ in. round wrought-iron handrail bent to sweep, fitted into walls, and finished with monkey-tail ends (or turned round to form a newel end).

These may also be in ornamental wrought or cast iron.
For sketches, see Mason, clauses Nos. 73 and 80.

Balcony railing.

(47)—Might be similar to clause No. 44, but generally less in height than area railings.

Balconettes to windows.

(48)—Put to all windows facing street, cast-iron balconettes, p.c. 25s. each, let into mortises in the stone sills and run in with lead, and ends fixed into walls.

Iron balusters to stairs and landings.

(49)—See clause No. 64 in Mason, and notes to same; also see Mason, Clauses Nos. 66, 68 and 75.

Iron handrail to stairs.

(50)—See clauses Nos. 69 to 71 in Mason.

Core to handrail.

(51)—See clause No. 64 in Mason.

Iron stays to handrail.

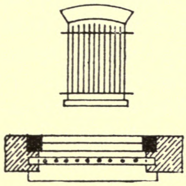
(52)—The handrail to be stiffened at the turns with $\frac{1}{2}$ in. diameter rod iron screwed to handrail or balusters. See notes to clause No. 220 in Carpenter.

Core to string.

(53)—See notes to clause No. 220 in Carpenter.

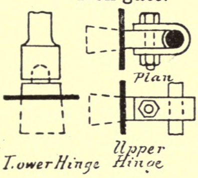
Guard bars to windows.

(54)—Fit basement (or other) windows with wrought-iron framed guard bars, composed of $\frac{3}{4}$ in. diameter round iron bars, placed at 5 in. centres, pointed and filed at top, and framed to a $1\frac{1}{2}$ in. $\times$ $\frac{3}{8}$ in. top and bottom rail built into reveals.



The vertical bars may pass through the bottom rail and be let into mortises in the window sills, and run in with lead.

Iron gate.



(55)—Allow a p.c. sum, whether in wrought or cast iron; describe the lock and fastenings.

For hinge stones, see clause No. 59 in Mason.

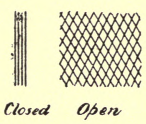
The sketch shows a simple method of hanging a moderately heavy iron gate to a brick or stone wall, the bottom of gate being hinged on a pivot, and the top being secured with a loose iron clip, bolted through. It will be seen that the gate can be easily removed at any time by merely unbolting the top clip.

Gate bar head.

(56)—See under clause No. 98 in Bricklayer.

Patent folding gates.

(57)—Allow a p.c. sum. These gates fold back into a very narrow compass, and in some positions are very useful.

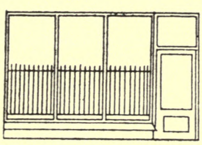


Grilles to doors or windows.

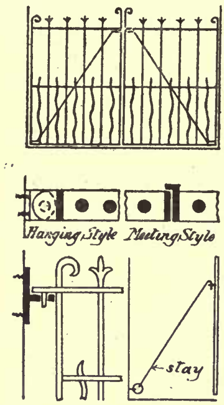
(58)—Allow a p.c. sum. State if in wrought or cast iron, and if fixed; or if made movable, with stubs, plates and bolts.

Movable grille to shop fronts.

(59)—The shop front to have a movable wrought-iron grille composed of $\frac{1}{2}$ in. diameter round iron rods, 3 ft. 6 in. high, at 3 in. centres, with filed forged points at top, and passing through two 1 in. $\times$ $\frac{1}{2}$ in. (or $\frac{3}{8}$ in.) horizontal bars, shouldered and riveted to similar vertical end pieces, and provided with gudgeons, eyes and staples, and a padlock p.c. 5s. Paint the work four oils.



Movable grille gates to shop lobby.

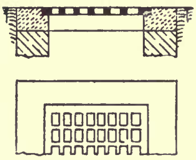


(**60**)—To be in wrought iron, riveted and welded together, and formed with $1\frac{1}{4}$ in. $\times \frac{3}{8}$ in. hanging styles, $1\frac{1}{4}$ in. $\times \frac{1}{4}$ in. braces, top, middle and bottom rails, and meeting styles, the meeting styles being formed with a rebate. The long vertical bars to be $\frac{7}{16}$ in. (to $\frac{3}{8}$ in.) round iron 6 ft. high, with ornamental forged heads, the small vertical bars to be $\frac{3}{8}$ in. round (or square) twisted iron 3 ft. 6 in. high, with forged pointed heads.

Hang gates with small pivots, to eye plates secured to shop front, and supply with a $\frac{3}{4}$ in. rod iron movable stay, one 9 in. bolt with floor socket, and one padlock p.c. 5s. with staples.

Paint gates four oils.

Grating to heating pipes.



(**61**)—The gratings over the heating pipes in trench to be (say) 2 ft. 6 in. wide, in perforated cast iron, $\frac{5}{8}$ in. metal, in lengths of 6 ft., with $\frac{3}{4}$ in. square perforations, $\frac{5}{8}$ in. bars, and 1 in. outer framing, and supported on cast-iron bearers.

For the stone kerb, see Mason, clause No. 36, and for the brickwork, see Bricklayer, clause No. 36.

The width of grating varies according to the depth of the pipes from the surface, and the number of pipes in the trench.

Arch bar.

(**62**)—With arches having insufficient abutments a relieving iron arch bar may become necessary. Describe it as being (say) $\frac{1}{2}$ in. (or $\frac{3}{4}$ in.) wrought flat bar iron arch bar, the full width of arch, with ends turned up, and bolted together through the arch with $\frac{3}{4}$ in. wrought-iron bolts, nuts and heads.

If the arch be very wide, two or more separate arch bars and bolts, placed side by side, may be required.

Range bearing bars.

(**63**)—May be in T-iron, I-iron, or flat bar iron, placed above the kitchen ranges to take the brickwork above. State size according to the weight to be supported, and bed on 3 in. rubbed (or tooled) York stone templates.

Also see Bricklayer, notes to clause No. 50.

Door shoes.

(**64**)—See Carpenter, clause No. 38, and Mason, clause No. 19.

Cast-iron door shoes to weigh about 7 lb. (to 10 lb.) each, and to be drilled, and fixed with countersunk screws to feet of frames; the stubs to be $1\frac{1}{4}$ in. (to 2 in.) square $\times 1\frac{1}{2}$ (to 2 in.) deep.

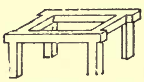
For sketches of door shoes, see Carpenter, clause No. 38, and Mason, clause No. 19.

Coal plate. (**65**)—See Bricklayer, clause No. 61.

Coal plates are made 12 in., 14 in., 16 in., 18 in. and 21 in. diameters, and may be either in solid iron plates, ventilating plates, illuminating plates, or ventilating and illuminating plates combined, and provided with chain, hooks and staple fastenings. They are made in sections suitable for fixing in stone, asphalt, or cement.

Scraper. (**66**)—Put two scrapers p.c. 10s. each, and fix in bed of concrete (or in a recess formed in wall with arched head).

Dust bin.



(**67**)—Allow the p.c. sum of £2 for a galvanised iron riveted circular dust bin, with outlet slide and hinged lid (or movable lid). Fix on 3 in. × 3 in. wrought deal framed bearers and legs, standing 12 in. high.

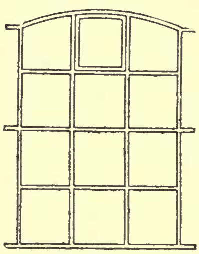
Dust bins are made in various sizes, and may be square. The old-fashioned brick and timber dust bin is rarely now used owing to its being insanitary.

Portable washing copper. (**68**)—To be a 20-gallon cast-iron portable copper, in cast-iron frame on wheels, with galvanised iron boiler (pan), and with iron flue taken into chimney flue.

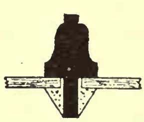
Also see Carpenter, clause No. 280.

Portable washing coppers are made to hold 6, 10, 15, 20, 40 and 50 gallons, and may have copper boilers. For coppers set in brickwork, see Bricklayer, clause No. 55.

Iron windows.



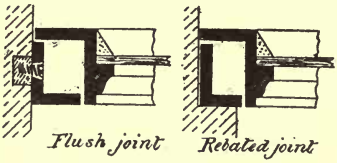
(**69**)—For factory work they may be formed with say 2 in. × 1 in. moulded and rebated wrought (or cast) iron bars, mitred (or bossed) at intersections, with lugs 4 in. long, every 2 ft. apart, attached to frame for building into walls. Hang one of the squares in frame on gun-metal centres, and provide with patent silent casement opener, and endless cord, p.c. 7s. 6d. Glaze the lights with 21 oz. sheet (or $\frac{1}{8}$ in. ribbed plate) glass in putty, and secure with iron pins (or screws).



Coat over the ironwork before glazing with two coats resin mixed with 1 part tallow, and after glazing, paint over with three coats oil paint.

Iron casements.

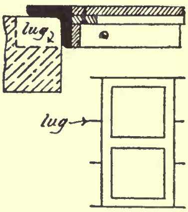
(**70**)—These are made in wrought iron, steel, or gun-metal, in about $\frac{1}{4}$ in. metal, in many various sections, and may be fixed either in a rebate, or flush with the stone or brickwork reveals, with the necessary bolts and stays. The glass should be plate $\frac{1}{4}$ in. thick, bedded in putty, and secured with iron pins (or screws).



There are various makers of iron casements, each having their own special sections. For Painting, see clause No. 69.

Wrought-iron door.

(**71**)—The door to be 6 ft. × 3 ft., framed up in wrought iron, with $\frac{1}{4}$ in. solid plate panels, $3 \times \frac{1}{4}$ in. styles and rails, and hung on wrought-iron pivot (or butt) hinges to 3 in. × 3 in. × $\frac{3}{8}$ in. angle iron jambs, head and sill linings, having an $1\frac{1}{4}$ in. × $\frac{3}{8}$ in. rebate riveted on, and fixing lugs every 2 ft. apart, secured to frame for building into walls. Provide door with a gun-metal lock and handle p.c. 15s., and two 12 in. wrought-iron barrel bolts.

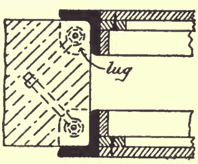


When doors are hung with two leaves, the meeting styles must be rebated.

Wrought-iron doors are also made 2 ft. and 2 ft. 6 in. wide, by 6 ft. high. Iron doors are used as a preventive against fire spreading from one part of a building to another. Steel may be used.

Wrought-iron party wall doors.

The London Building Act requires that when two buildings, taken together, exceed 250,000 cubic feet in extent, and are connected together through an opening in the party wall dividing them, that the opening shall be provided with two hinged wrought-iron doors, having the panels at least $\frac{1}{4}$ in. thick, placed at the full thickness of the wall apart, and let into wrought-iron rebated frames. The opening must not be more than 7 ft. wide or 8 ft. high. When the wall is 24 in. thick and over, the opening may be 9 ft. 6 in. high.



The descriptions of these doors would be similar to the description given under this clause for a single door, except the lugs might be connected together with irons hooking on to each other and bolted to the lugs.

The doors may be hung on strong wrought-iron butt hinges. The panels may also be $\frac{3}{8}$ in. and $\frac{1}{2}$ in. thick.

Similar framed wrought-iron sliding doors, with wheels and running bar, may be used to party wall openings; as also corrugated wrought-iron or steel revolving shutters, sliding in iron grooves; see Carpenter, clauses Nos. 166 and 315.

Safe and strong room doors.

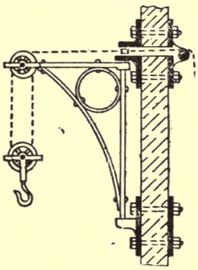
Iron and steel doors to safes and strong rooms are made in sections by the various makers to their own special patterns.

Outside iron staircases.

(72)—The strings, carriages, balusters, handrails, bolts and framings should be in wrought iron; the cantilevers, columns, brackets, treads, risers and landings may be in cast iron. Describe a concrete fixing block at the foot for the strings to bed into, together with the excavation, cutting away, making good and painting.

Cranes.

(73)—Put a wrought-iron revolving jib crane for raising 3 cwt. (more or less), with chain, pulley blocks, bolts, plates, brackets, and winding gear and handle; and pin securely into wall.



Iron chimney pieces.

(74)—Allow a p.c. sum. They are made in various designs, and in sizes to suit the stoves, and are often attached to the stoves, and are fixed to plugs in the walls with screws. Describe the painting to match the other work.

For other kinds of chimney pieces, see Carpenter, clause No. 215; Mason, clauses Nos. 53 and 124; and Slater, clause No. 18.

(75)—

(76)—

(77)—

(78)—

(79)—

(80)—

Stoves and Ranges.

(Clauses Nos. 81 to 99.)

STOVES.

(Clauses Nos. 81 to 89a.)

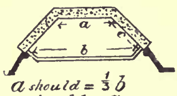
For chimney pieces, see clause No. 74; Mason, clauses Nos. 53 and 124; Carpenter, clause No. 215; and Slater, clause No. 18.

Rooms may be warmed either with closed or open fire stoves.

In the ordinary open fireplaces seven-eighths of the heat is lost.

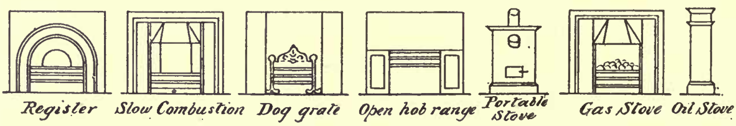
Closed stoves give more heat than open fire stoves, but are not so healthy.

Iron conducts heat away and does not radiate the heat. Firebrick radiates heat, and should therefore form the back and sides of a stove.



The width at the back of an open fire stove should be one-third to one-half the width of the front, the depth should equal the width at the back. Fireplaces and flues work better if kept against internal walls. Stoves should not be placed too far back in the chimney opening, otherwise much of the heat is lost.

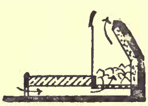
The two classes of stoves most commonly used for warming living and bed rooms are those known as the Register and Slow Combustion Stove. Other suitable forms of stoves may be classed under the names of dog grates, open hob ranges, portable stoves, gas, charcoal and oil stoves. Here are some sketches of the various stoves:—



The main difference in the classes of stoves for consuming fuel is the method by which they are supplied with air, thus:—

Register stoves and open hob ranges are supplied with air through the fire bars, both on the underside and in front of the grate.

Slow combustion stoves are supplied with air mostly through the bars in front of the grate.

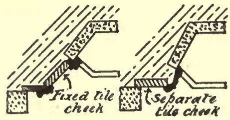


There is a form of slow combustion stove made with a raised hearth in front, the air being supplied through a small flue under the hearth.

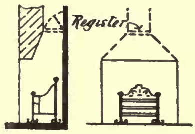
Dog stoves are supplied with air from all round.

Portable stoves, gas, oil and charcoal stoves are generally fixed loose into or near a fireplace opening. In the case of portable and gas stoves, a flue pipe should be connected into the ordinary chimney flue.

Register and slow combustion stoves may have tile or brick cheeks round the fronts, either attached and forming part of the stoves themselves, or else fixed round separately afterwards.

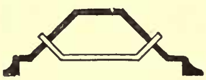


Dog stoves are grates or baskets to contain the fuel, and are placed quite loose in the fireplace openings. The back and cheeks of the fireplace openings may be tiled or bricked round. Owing to the large amount of open space around dog stoves, they are liable to smoke, the flue should therefore be of some height, and gathered over quickly at the base, both from the sides and the front, and be finished with an iron register plate immediately over the grate.



Open hob ranges usually have the cheeks and backs above the ranges formed in iron, or firebrick. For the same reason as with dog stoves, they also are very liable to smoke, and the flues may be treated in a similar manner. Sometimes an iron blower is fixed in front to assist the draught.

A very simple form of grate is made with the cheeks and back lined round in glazed (or other fire) brick, to which the bars are fixed, forming the grate; the flue is left quite open above the grate, without a register.



In ordinary size living rooms having register or slow combustion stoves, the fireplace opening, between the brickwork, may be made 2 ft. 6 in. to 3 ft. wide by 14 in. deep. In large rooms, from 3 ft. to 3 ft. 6 in. wide by 14 in. deep. In small living rooms, from 2 ft. to 2 ft. 6 in. wide by 14 in. deep. In ordinary size bedrooms, from 2 ft. to 2 ft. 6 in. or 3 ft. wide by 14 in. deep, and in small bedrooms, from 12 in. to 18 in. or 20 in. wide by 14 in. deep. With dog stoves, the size may be 3 ft., 3 ft. 6 in. to 4 ft. wide by 18 in. deep.

Register and slow combustion stoves should be built round at the back in solid brickwork, see Bricklayer, clause No. 53; but when either of these two classes of stoves is fixed into an old fireplace opening, the filling round at the back may have to be done with fine concrete thrown in by hand, unless the whole chimney piece be first removed, which is by far the better plan.

Register stoves are made in sizes from 14 in. wide, advancing by 2 in. up to 3 ft. 4 in. wide, and either with or without tiles.

Slow combustion stoves are made in sizes from 2 ft. 8 in. wide, advancing by 2 in. up to 3 ft. 4 in. wide, and either with or without tiles.

Stove interiors (that is, the grate itself without side covings or tiles) are made in sizes from 18 in., advancing by 2 in. up to 30 in.

Hob registers are made in sizes from 14 in., advancing by 2 in. up to 36 in.

Mantel registers (that is, the stove and iron chimney piece combined) are made in sizes from 24 in. right across, advancing by 2 in. up to 30 in., and in 36 in., 42 in. and 48 in. sizes.

All classes of stoves are generally either 3 ft. or 3 ft. 2 in. high, except in mantel registers, when the height varies according to the amount of ornament.

Register and slow combustion stoves.

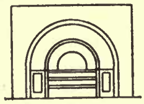
(81)—Allow the p.c. sum of (say) £30 for register and slow combustion stoves, with tile cheeks (jambs).

See Bricklayer, clause No. 53, for building in.

State if the tile cheeks are fixed independently of the stoves, as they require more labour. The ironwork round the stove may be finished in "dull black," or "B.B." finish (a superior and polished surface).

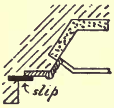
The stoves may have brass, copper, or steel mountings (ornaments).

Register stoves may have small hobs at the sides.



Hob Register

When a stove is too small for the opening between the chimney piece jambs and frieze, either marble or iron slips must be described to make out the difference. For marble slips, see Carpenter, clause No. 215.



High-pressure boilers may be fixed around the backs of register or slow combustion stoves if required for heating purposes.

Fix new stove in old chimney opening.

(82)—Take out existing stove in dining room and fix a new slow combustion (or register) stove, p.c. £5, with iron slips to make out the width, and with tile cheeks fixed separately round the front. Fill in round the back in solid brickwork, or in fine concrete thrown in by the hand.

State if the chimney piece is to be removed, refixed, and all made good around. See notes to clause No. 81, as to iron or marble slips; and notes preceding clause No. 81, as to building in the stoves.

Stoves with raised hearths.

(83)—Allow a p.c. sum. As these stoves throw off a very great amount of heat, the work around them must be well protected with fire-resisting substances.

See notes preceding clause No. 81, page 350, referring to these stoves, and clause No. 53 in Bricklayer for building in.

Plain bar grates.

(84)—Line round the fireplace opening in hall with glazed bricks, and form the grate with front and bottom firebars, let into the brickwork.

Dog grates.

(85)—Allow the p.c. sum of (say) £20 for dog grates with iron registers. Tile round the back and cheeks with glazed tiles, p.c. 10s. per yard. The base of the flue to be gathered over quickly from the front and sides.

See notes preceding clause No. 81 as to dog grates.

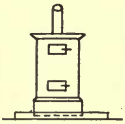
Dog grates may have brass or copper mountings. The back and cheeks may be in glazed brickwork.

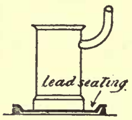
Open hob ranges for bedrooms.

(86)—Allow the p.c. sum of (say) £10 for open hob ranges with iron backs and sides, register and blower (or with iron skirting, register and blower, and firebrick back and sides).

Open hob ranges are seldom now used in living and bed rooms, except in middle class property.
See Bricklayer, clause No. 53, for building in stoves.

Portable stove.

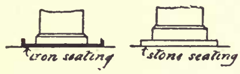


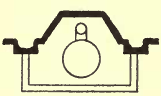


(87)—Allow the p.c. sum of (say) £10 for a portable stove in Hall. Carry up the well of staircase a 6 in. diameter sheet-iron flue to 5 ft. above roof, with soot door at base; support the pipe with iron stays to woodwork of stairs and roof, and protect the woodwork of stairs with sheet-iron shields, both at the back of the stove and where the pipe passes the strings. The stove to be placed on a 7 lb. lead seating 12 in. larger each way than the stove, dressed over with a welt and copper nailed 1 in. apart to a 3 in. × 2 in. wrought deal angle fillet.

This form of sheet-iron flue carried up the well of a staircase is somewhat dangerous, as the iron soon decays and falls to pieces. It is preferable to take the flue into an ordinary chimney flue; or a cast-iron flue may be used, but it is somewhat unsightly.

The stove may be placed on a wrought sheet, or cast-iron seating, or upon a 3 in. (or 4 in.) sawn all round and rubbed on top face and edges hard York stone slab. If the floor be paved with tiles, stone, or brick, a seating is not absolutely required, it being mainly as a protection against fire where there is a boarded floor.





When a portable stove to a living or bed room is placed on the fireplace hearth, the iron flue pipe from the stove would only be carried up the chimney flue about 3 ft. or 4 ft.

Gas stoves.

(88)—Allow a p.c. sum. For gas, see Gasfitter, clause No. 8.

Gas stoves should be provided with a high flue, otherwise the down draught may cause them to be very obnoxious.

Oil stoves.

(89)—Allow a p.c. sum.

Charcoal stoves.

(89a)—Allow a p.c. sum.

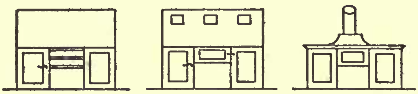
A charcoal stove is somewhat of the same shape as an oil stove, see sketch of oil stove in the notes preceding clause No. 81.

Ranges and Hot Plates.

(Clauses Nos. 90 to 99.)

For chimney pieces, see Mason, clause No. 53.

Ordinary cooking ranges may be divided into three classes: "Open-fire Ranges," "Close-fire Ranges" (Kitcheners), and "Portable Ranges"; see sketches below.



Open fire Range   Close fire Range   Portable Range

Ranges of various kinds may be had in sizes from 20 in. wide, advancing by 2 in. up to 48 in.; and in 54 in., 60 in., 66 in. and 72 in. sizes.

Cooking may also be done by gas or charcoal stoves.

In a close-fire range (kitchener) the fire is enclosed on top, and the flues from the fire and ovens enclosed with iron (or tile) covings at the back, top and sides (cheeks).

The fire may also be made to act either as an "open," or as a "close" fire. "Close-fire ranges" (kitcheners) are usually made 36 in., 42 in., 48 in., 54 in., 60 in. and 66 in. long, by 21 in. to 23 in. deep, the brick openings should therefore be about these sizes. The fire opening itself may be 10 in. to 14 in. wide. Roasting is chiefly done in the ovens.

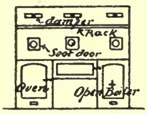
In an "open-fire range" the fire and flue are quite open, similar to an open hob range, see notes preceding clause No. 81; but the oven flues are enclosed with iron covings at the back and sides. "Open-fire ranges" are usually made 33 in., 36 in., 39 in., 42 in. and 48 in. long, by 18 in. to 21 in. deep, the brick openings should therefore be about these sizes. An "open-fire range" ventilates a kitchen better than either a close-fire or a portable range; it is chiefly used for roasting in front of the fire. In large establishments where there is much cooking, an open-fire range is indispensable, the fire opening being from 2 ft. to 3 ft. wide.

Fire bars are made 10 in., 12 in., 14 in., 16 in., 18 in., 20 in., 22 in., 24 in., 27 in., 30 in. and 36 in. long. Fire bars from 10 in. to 14 in. long are mostly used in "close-fire ranges" (kitcheners) and small "open-fire ranges"; and from 16 in. to 36 in. long in large "open-fire ranges."

A portable range stands clear of the walls, the flue being an iron pipe taken into an ordinary fireplace flue. The fire may be made to act either as an "open" or "close" fire. Portable ranges are usually made 30 in., 36 in., and 42 in. long by 17 in. deep. The fire opening may be 10 in. to 14 in. wide. The roasting is only done in the ovens.

"Open" and "close" fire ranges and portable ranges may either have an open boiler supplied with a feed cistern, or a high-pressure boiler for hot water circulation. An open boiler is usually at the side, and a high-pressure boiler at the back.

Close-fire range (kitchener) with oven and open boiler.



(**90**)—Supply kitchen with a close-fire range, (say) p.c. £16, 4 ft. (3 ft. to 5 ft. 6 in.) long, 12 in. (10 in. to 14 in.) fire, oven one side, open boiler with brass tap other side, bright mountings, iron skirting (or iron or tile back and covings) round top, ash-pan, dish-rest, plate-rack, draw-fret, dampers and frames, sliding register and soot doors. Form the flues. See under clause No. 30 in Plumber for the feed tank to the open boiler. For jack cranes, see clause No. 94.

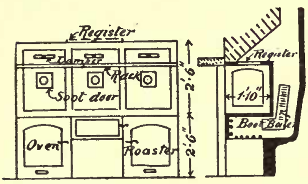
Kitcheners are also made so that the fire may be either "open" or "close" at will.

For setting ranges, see clause No. 54, under Bricklayer.

State if a hot-air chamber is to be provided above the plate-rack with hinged or sliding doors.

Dampers and frames are made 4 in. × 6 in., 5 in. × 6 in., 6 in. × 8 in., 7 in. × 9 in. and 8 in. × 10 in.

Close-fire range (kitchener) with high-pressure boiler, oven and roaster.

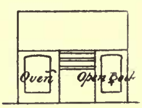


(**91**)—Supply kitchen with a close-fire range, (say) p.c. £16, 4 ft. (3 ft. to 5 ft. 6 in.) long, 12 in. (10 in. to 14 in.) fire, oven one side, roaster other side, bright mountings, iron skirting (or iron or tile back and covings) round top, ash-pan, dish-rest, plate-rack, draw-fret, dampers and frames, sliding register and soot doors. Put a $\frac{3}{8}$ in. plate wrought-iron welded boot (or other shape) boiler with manhole, and flue at back, with inlet and outlet holes for circulating pipes; and form the flues. For jack crane, see clause No. 94.

A "roaster" is for cooking meat, and an oven for pastry. If a roaster is not required as well as the oven, describe the place it would occupy as a "sham."

See Bricklayer, clause No. 54, for setting to range.

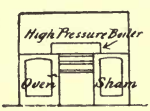
Open-fire range with oven and open boiler.



(**92**)—Supply kitchen with an open-fire range, (say) p.c. £10, 3 ft. 6 in. (2 ft. 9 in. to 4 ft.) long, 12 in. (10 in. to 14 in.) fire, oven one side, open boiler and brass tap other side, bright mountings, iron skirting round top, ash-guard, dish-rest and draw-fret. See under clause No. 30 in Plumber for feed tank to the open boiler. For jack or smoke crane, see clause No. 94.

See clause No. 54 under Bricklayer for setting.

Open-fire range with high-pressure boiler, oven and sham.



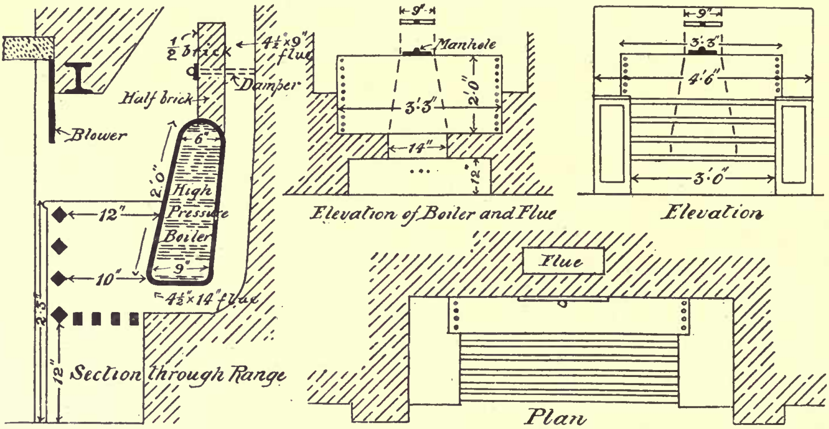
(**93**)—Supply kitchen with an open-fire range, p.c. (say) £14, 5 ft. long, 2 ft. 6 in. fire, wrought fire-bars, fall-bar, winding cheek, falling crow-bar, draw-out stand, oven one side, sham the other side, bright mountings, iron skirting (or covings) round top, dish-rest, draw-fret, dampers and frames, sliding arch-plate, and a 2 ft. 6 in. wrought-iron riveted boiler at back, with manhole, and inlet and outlet holes for circulating pipes; and form the flues. For jack or smoke crane, see clause No. 94.

Also see clause No. 94 for fuller details.
See clause No. 54 under Bricklayer for setting.

Open range with high-pressure boiler, but without ovens.

(**94**)—Here is a more detailed description than clause No. 93 for a large open fire for roasting in large establishments:—

Supply kitchen with an open fire range, 3 ft. fire, composed of four $1\frac{3}{4}$ in. round (or square) wrought (or cast) iron movable front fire-bars let into cast sockets

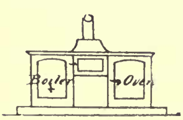


at the sides; $1\frac{1}{2}$ in. × $1\frac{1}{4}$ in. wrought (or cast) bottom fire-bars 1 in. apart. Cast-iron side plates and top with sham fronts on either side and sliding blower in front. Put at back a wrought-iron riveted $\frac{3}{8}$ in. plate high-pressure boiler, 3 ft. 3 in. long, 2 ft. high, 9 in. to 6 in. deep, with manhole, and holes for circulating pipes. Build round in firebrick, form flues under and at back of boiler 14 in. × 6 in., diminishing to 9 in. × $4\frac{1}{2}$ in. for 3 ft. above top of boiler, and furnish with a damper and frame.

Put two brass (or wrought-iron) jack cranes, 1 ft. 10 in. long, with slide hooks and plates, and fix to the bearing bar of chimney breast.

State if a smoke jack is required instead of the jack cranes. If ovens are required they would have to be elsewhere in a separate range, or else as in clause No. 93.

Portable range (kitchener).



(**95**)—Fix on a 3 in. sawn all round and rubbed top and edges, hard York stone seating, 12 in. wider each way than range (or 7 lb. lead or iron tray, as clause No. 87), a portable range 3 ft. 6 in. (2 ft. 6 in. to 3 ft.) long, p.c. £10, with oven one side, open boiler with brass tap other side, bright mountings, 10 in. (to 14 in.) fire, dish-rest, draw-fret and soot doors. Take a 6 in. iron flue pipe 3 ft. up chimney flue, with damper.

See under clause No. 30 in Plumber for feed tank to the open boiler.

There are many good portable ranges.

Portable ranges may be made with "open" or "close" fires, as also with hot-air chambers.

Coal hot plate.

(96)—If gas is not obtainable, a hot plate may be heated with a coal fire. Allow a p.c. sum for hot plate, with fire doors, dampers, soot doors and skirting. State the size, such as 3 ft. to 4 ft. 6 in. long, and state if with ovens. Form flues and build in.

Hot plates heated with fuel are built into an opening similar to a kitchener, but if the hot plate stand out from the wall, describe an iron hood over, as in clause No. 98.

Charcoal hot plate.

(97)—When gas is not obtainable a charcoal hot plate may be supplied. Allow a p.c. sum and state the size, such as from 3 ft. to 4 ft. 6 in. long. Describe an iron hood as clause No. 98, if the charcoal stove stand out from the wall.

Charcoal hot plates are fixed quite loose, and no flues are required, but a flue should be taken from the hood.

Gas hot plate.

(98)—Allow a p.c. sum and state size, such as from 3 ft. to 4 ft. 6 in. long.

Fix a $\frac{1}{16}$ in. galvanised iron riveted plate hood over hot plate, with the flue taken into a separate chimney flue.

For laying on gas, see clause No. 8 under Gasfitter. Gas hot plates are generally fixed clear of the walls, and no flues are required, except from the hood.

Gas oven.

(99)—Allow a p.c. sum, and state the size, and take a flue pipe into a chimney flue.

For laying on gas, see clause No. 8 under Gasfitter. A gas oven may be fixed on a stand quite loose.

(100)—

(101)—

(102)—

(103)—

(104)—

(105)—

Heating.

(Clauses Nos. 106 and 107.)

In addition to warming rooms by the various stoves mentioned under clauses Nos. 81 to 89a, buildings may also be heated by hot-water pipes, steam pipes and hot air; the heating by hot-water pipes being that mostly employed.

Heating by steam in certain positions is considered dangerous, and being little used in domestic buildings will not be further mentioned.

Heating with hot air is done by drawing cold air around a special stove, such as a Convoluted Stove, and conducting the heated air through flues and shafts to the various positions required. As it is little used for ordinary purposes the details will not be further described. It is chiefly employed in Turkish baths.

Heating with hot water may be done by either of the two methods, known as the "high-pressure system" or the "low-pressure system."

The high-pressure system consists of a coil of small hermetically sealed wrought-iron pipes, some $1\frac{3}{8}$ in. external diameter, $\frac{7}{8}$ in. bore, which are placed in a furnace, and from which similar pipes are taken to the various positions required. Owing to the pipes attaining a temperature of some 400° Fahr. it is considered somewhat dangerous in certain places, and will not be further mentioned.

The low-pressure system consists of pipes some 2 in., 3 in. and 4 in. diameters, connected to a boiler, the temperature in them being raised to not more than 200° Fahr.; 180° to 185° Fahr. is considered a good working temperature, as the water should never be allowed to boil (boiling point is 212° Fahr.). Pipes 4 in. diameter require more fuel, and take longer to heat than 3 in. or 2 in. pipes, but they retain the heat for a greater length of time.

The temperature of a room should be from 60° to 62° Fahr., and the humidity range between 73 and 75 per cent. Some hospitals and horticultural buildings require more heat.

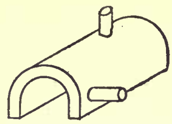
In heating ordinary domestic buildings up to 50° to 65° Fahr., allow from 8 to 12 ft. run of 4 in. pipe per 1000 cubic ft. of space; but if with 2 in. pipes, then allow double that quantity. With 3 in. pipes, allow one-third more in length than for 4 in. pipes. Warehouses and public halls require about 6 ft. to 7 ft. run of 4 in. pipe per 1000 cubic ft. of space; schools about 7 ft. or 8 ft.; horticultural buildings about 35 ft. to 50 ft.; and hot-air chambers and drying stoves about 230 ft. to 250 ft., the last named positions acquiring a temperature of some 120° to 130° Fahr. In each case, to attain a like result, double the quantity of 2 in. pipe is required, or one-third more than the 4 in. pipe if 3 in. pipes be employed. When pipes are buried in the ground allow one-third more of piping for loss of heat. The heating surface, that is the area of metal, of a 4 in. pipe is twice that of a 2 in. pipe, but the volume of water is four times as great.

Heating pipes must never rise and fall alternately; the flow pipe should continue to rise from the boiler to the highest point to be served, and the return pipe always fall to the boiler. Pipes should not be laid with a less rise than 4 in. in 100 ft., but preferably 8 in. should be the minimum, but the quicker the rise the better the circulation.

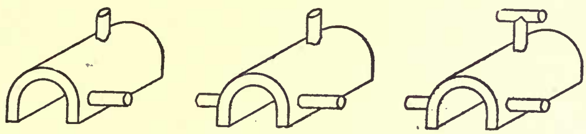
One square foot in area of boiler surface upon which the fire directly plays will heat nominally 50 ft. run of 4 in. pipe (about 27 gallons), or 200 ft. of 2 in. pipe, or 80 ft. of 3 in. pipe; in practice, however, it is better to take one-fourth less than these lengths to obtain a satisfactory result; but one square foot in area of boiler surface where next the flues will only heat one-third to one-fourth these amounts.

Boilers should be set on their beds with a rise in their length from the front to the back of $\frac{3}{4}$ in. to 1 in. to the foot. The flues around the boiler are generally 5 in. wide, and should also rise $\frac{3}{4}$ in. to 1 in. to the foot in the direction the flame is to take. The flue around the back of the boiler, where it is sometimes difficult to sweep, should be 9 in. wide.

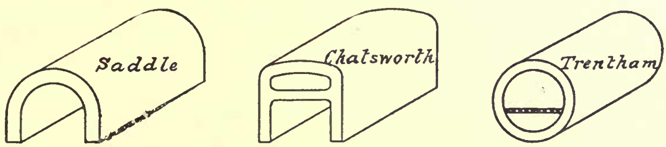
The flow pipe should be taken from the back of the boiler at the top, and the return pipe or return pipes brought down to the bottom at the front.



A boiler may have one flow with one return, or one flow with two returns. If more than one flow be required they should each be branched out of the one flow from the boiler, and not connected separately with the boiler. See sketches below:—



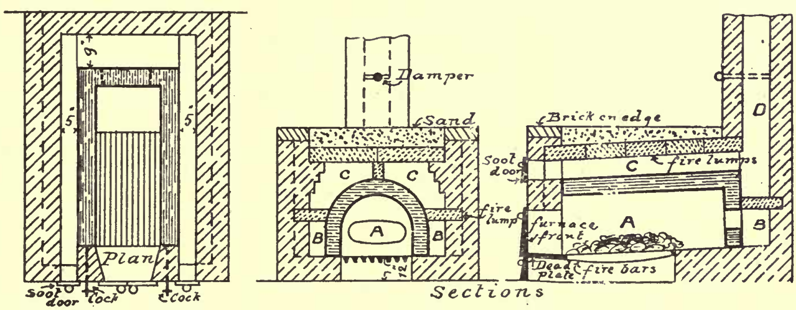
The most suitable forms of fixed boilers are those known as the saddle boiler, the Chatsworth boiler, and the Trentham Cornish boiler. See sketches below:—



There are many other various kinds of boilers, both fixed and independent, which are suitable in certain positions.

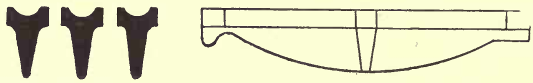
Here are a few further notes upon boilers and their fixing:—

The sketches show the details of the setting of a saddle boiler. The



flame travels from the fire at A along the flues B to the front of the boiler, and returns to the back of the boiler along the flue C into the main shaft at D. Wherever the boiler touches or the flame passes, the flues must be built in firebrick $4\frac{1}{2}$ in. thick, set in fireclay; the top may be formed in fire-lumps 4 in. thick, supported at the centre on fire-bricks if the lumps be not long enough to carry right across the head of the boiler; or else upon T-irons as shown in the sketches below of a Chatsworth boiler setting. Above the fire-lumps the top is filled in with about 6 in. of ordinary sand, unless the top be required for stacking the firing tools upon, when it may be finished in ordinary brickwork. A saddle boiler may be arched over on top instead of being covered with fire-lumps. The two cocks shown on the plan are for cleaning purposes, and emptying the boiler. Manholes are not always put to heating boilers, as there is very little liability to furring up, owing to the water being seldom changed; but where the water is extremely hard, perhaps manholes, or mudholes as they are called, are absolutely necessary.

Fire-bars should not be more than $\frac{1}{4}$ in. or $\frac{3}{16}$ in. apart, the best shape being that shown in sketch, called the fish-belly section.



There should be plenty of soot doors to the boiler flues, in order that they may be thoroughly cleaned out in every part.

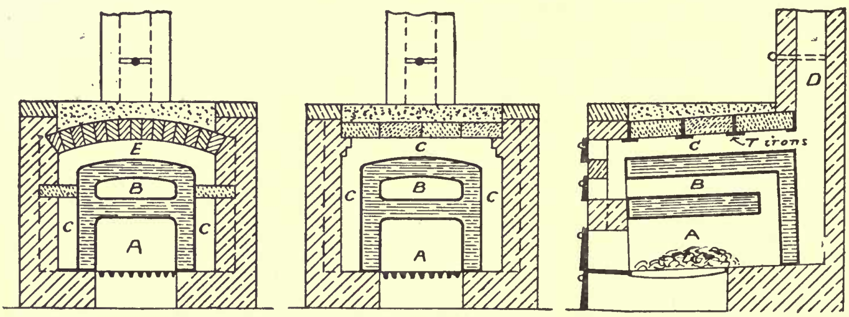
The furnace front may either be hinged or sliding, preferably sliding.

Saddle boilers are made from 18 in. long, and increasing in length by every 6 in., up to 5 ft. long.

When the main flue shaft D has to be carried along almost horizontally before it ascends vertically the area of the horizontal flue should be twice the area of the vertical flue. The area of the vertical flue varies according to the size of the boiler.

When the boiler brickwork stands quite separate from the adjoining walls, the brickwork, exclusive of the half firebrick lining, should be at least 9 in. thick, preferably 14 in. thick, and it should be tied in across the width of the boiler at the top and bottom with iron rods connected to vertical irons in one or two places, otherwise the heat is liable to bulge the work out.

Here are some sketches of the setting of a Chatsworth boiler:—



Alternate Sections.

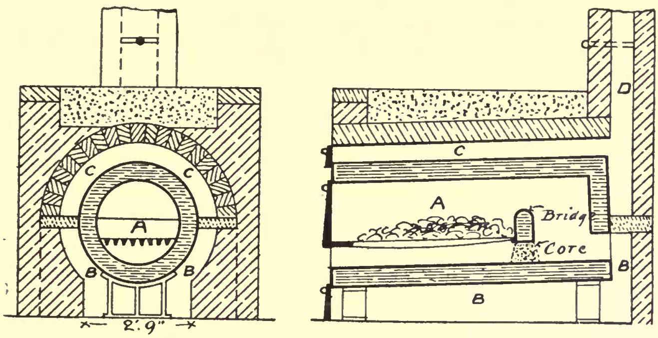
Taking the two right-hand sections, the flame travels from the fire at A, along the flue B formed in the boiler to the front, and returns to the back of the boiler along the flue C to the main shaft at D.

The left-hand section shows an alternate way of arranging the flues, the flame travelling over the fire A, through the flue B to the front, and entirely round the boiler through the flues C to the front again, and back along the flue E to the main shaft at D.

The other remarks mentioned about the setting of a saddle boiler would apply equally to a Chatsworth boiler.

Chatsworth boilers are made from 2 ft. long, and increasing in length by every 6 in., up to 7 ft. long.

Here are two sketches of the setting of a Trentham boiler:—



The flame passes from the fire at A over the bridge to the back of the boiler, returning to the front along the flue B, and back along the flue C to the main shaft at D. The core under the bridge is made in sand, and is only removed when cleaning out the space at the back of the bridge. If the core be not replaced, the proper amount of heat will not be obtained from the boiler, as the draught will be liable to go past the fire-bars and into the flues direct. The same remarks as to the setting of a saddle boiler equally apply to a Trentham boiler, but only one emptying-out cock is required in a Trentham boiler.

Trentham boilers are made from 3 ft. long, and increasing in length by every 6 in., up to 6 ft. long, and from 7 ft. long by every 12 in. up to 12 ft. long.

The metal of boilers may be $\frac{5}{16}$ in., $\frac{3}{8}$ in. or $\frac{1}{2}$ in. thick. The least working space in front of a boiler should be sufficient for raking out the fire with raking tools. The floor above a boiler should be fire-resisting, as in Excavator, clause No. 41. A drain must be provided in a boiler-house, if possible, for emptying out the boiler into. In places where a boiler is little used, cast iron will stand better than wrought iron.

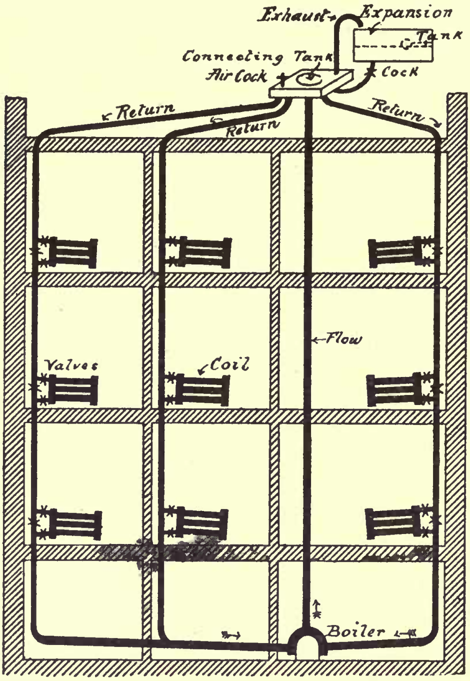
When boilers are not at work the dampers should be closed.

In heating by this low-pressure system, the coils may either be branched off the main flow pipe, or, and by far the better plan when there are many coils to heat, by taking them off from several return pipes. This main flow pipe is usually 3 in. or 4 in. diameter, and the return pipes are each 2 in. diameter, and in some cases $1\frac{1}{2}$ in. and 1 in.

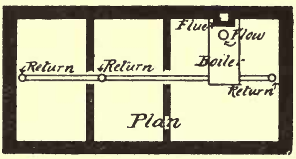
In clause No. 106 is a description of warming a building by the low-pressure system, having one flow pipe and several return pipes.

Boiler and main flow.

(**106**)—Allow the sum of £30 for a welded wrought-iron saddle (or Chatsworth) boiler (or riveted steel plate Trentham boiler), with damper, fire doors, dead plate, soot doors, fire-bars, fire bricks, two 1 in. emptying pipes with cocks, stoking tools, and setting the boiler in firebrick and forming the flues.



Take a 3 in. (or 4 in.) cast-iron main flow pipe, from top end at back of boiler, with a brass cased thermometer fixed in it, and connect to a 2 ft. × 2 ft. × 10 in. × $\frac{3}{8}$ in. plate wrought-iron welded connecting tank, on fir bearers in roof, having a 14 in. diameter manhole bolted on, a brass air-cock, and an 1 in. wrought-iron exhaust pipe turned over supply cistern.



A 4 in. main flow pipe, under this system, will be sufficient to heat about 5000 ft. run of 4 in. pipe, or 20,000 ft. run of 2 in. pipe; a 3 in. main flow pipe will heat about 3000 ft. of 4 in. pipe, or 12,000 ft. of 2 in. pipe.

Return mains.

Bring down from connecting tank in roof three (two or more) 2 in. wrought-iron return mains, branching into 3 in. cast-iron return mains at the foot, connected to the front end of boiler at the bottom.

A 4 in. main flow will serve about nine 2 in. return mains, and a 3 in. main flow about six 2 in. return mains.

The wrought-iron return mains may be 2 in., $1\frac{1}{2}$ in., and 1 in., according to the work put upon them.

Coils.

Branch off from these 2 in. wrought-iron return mains to each separate coil with $1\frac{1}{4}$ in. flow and return pieces, each having a gun-metal screw-down valve with capstan head fixed in it, with a brass throttle valve fixed in the 2 in. return mains between. The 2 in. return main serving the coils on the staircase is to be without any throttle valves. (This will allow the water to return to the boiler should all the throttle valves be closed.) The coils in the various positions to be formed with 2 in. (3 in. or 4 in.) cast-iron pipes, let into cast-iron end blocks, slightly tilted. Then give the sizes and positions of the coils, such as say:

Two coils in drawing-room, each six pipes high, 8 ft. long, 2 in. (3 in. or 4 in.) diameter.

Two coils in dining-room, each six pipes high, 8 ft. long, 2 in. (3 in. or 4 in.) diameter.

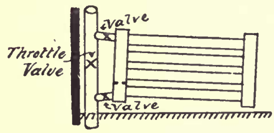
And to any other rooms and staircases; and if under the bath, see Carpenter, clause No. 278.

In calculating the size of the coils required to heat the various positions, see the previous notes as to heating capacity of pipes; the end blocks to the coils, and the 2 in. return mains should be taken into consideration as actual heating surface.

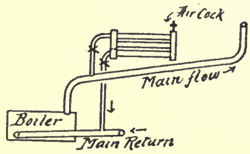
The screw-down valves are for turning the water on and off to any separate coil or for repairs. The throttle valves are for regulating the flow of water into the coils, and down the return mains. But when several coils are placed over each other, and within a short distance of the 2 in. return mains, no throttle valves are absolutely necessary, as each of the coils would obtain practically the same amount of heat; but if one coil happen to be some distance away from a 2 in. return main, then a throttle valve becomes necessary.

When the throttle valves have once been regulated to the requirements of the various coils, they should not be again touched, but the screw-down valves on the coils may be shut off and on when required. Radiators may be fixed instead of coils, they give more heat, but are expensive.

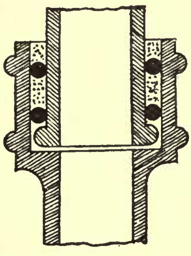
The coils being slightly tilted, as sketch, will allow air to find its way out up the 2 in. return mains, and ensure efficient circulation, no air-cocks being required.



When a coil has to be taken off the main flow pipe, it should be as sketch, with an air-cock at the highest point. Air-cocks are to let out the air in the pipes, otherwise they may not get fully charged with water.



Jointing.



All cast-iron pipes, both in main and coils, to be jointed together with gaskin and specially prepared fine Portland cement in the following manner. First tightly ram in a ring of gaskin, then fill up to two-thirds the depth of socket with Portland cement, ring round again with gaskin and finish with cement as before. All wrought-iron pipes to be jointed together with red lead cement, and screwed joints. Put all tees, bends, unions, supports, fastenings and other connections.

A Portland cement joint is one of the best known methods of jointing cast-iron heating pipes together, but the cement must be specially prepared, and is supplied by certain manufacturers for this purpose.

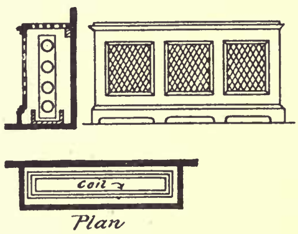
Felt round pipes. All pipes in roof to be bound round with silicate cotton and canvas (or asbestos composition).

If buried in trunks in the ground they may also be bound round in a similar way or with hair felt. Hair felt harbours moth.

Supply cistern or expansion tank. Fix in roof a 150 (200 or 100) gallons riveted galvanised iron cold water supply cistern (expansion tank), fixed on fir bearers; take 1 in. wrought-iron cold supply with stop-cock and connect to connecting tank. Lay on $\frac{1}{2}$ in. lead supply to supply cistern with ball-cock fixed half-way down the tank. For overflow, lead tray and casing round cistern, see Plumber, under clause No. 30.

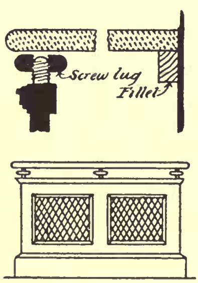
The supply cistern (expansion tank) must be fixed at a higher level than the connecting cistern, and being only half full of water in this position, acts as an expansion tank. The supply pipe is sometimes brought right down to the boiler, and connected in at the bottom.

Coil cases. Enclose round coils with cast-iron coil-cases $\frac{3}{8}$ in. (or $\frac{1}{2}$ in.) metal, having perforated and moulded top-rails and bases, perforated and moulded panels, hinged access doors to valves and fixed together with bolts, nuts, and straps. (Coils in some positions may do without cases.) All coils to have cast-iron trays, $\frac{1}{4}$ in. metal 2 in. deep (screwed together at joints, if long), with $\frac{1}{2}$ in. outlet pipes discharging outside through wall.



For outside gratings to air inlets to coils, see Bricklayer, clause No. 57.
For timber coil casings, see Carpenter, clause No. 313.
The trays catch any leakage water.

If the coil cases have marble tops, describe them as:—



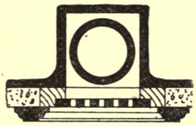
Enclose round coils with cast-iron coil cases $\frac{3}{8}$ in. (or $\frac{1}{2}$ in.) metal, having moulded top rails with screw nuts and lugs, perforated and moulded panels and bases, hinged access doors to valves, and fixed together with bolts, nuts and straps.

Describe the trays as before mentioned, and state if any of the coils are to be without cases.

The tops to be in 1 in. sawn Sicilian (veined or other) marble, polished on top face, with rounded and polished front and return edges, and laid on deal fillets spiked to walls.

The screw lugs are for regulating the marble top horizontally to a nicety.

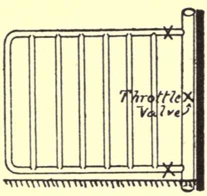
Gratings.



The gratings in front of the return mains to be perforated cast-iron, $\frac{3}{8}$ in. metal, 5 in. wide, screwed with countersunk screws every 12 in. apart to rebated deal fillets with small mouldings planted on to cover joint with the plastering. The gratings to stop 4 in. short of the skirtings and cornices. For gratings to horizontal pipes in channels, see clause No. 61.

See clause No. 36, under Bricklayer, for piers or channels for horizontal pipe mains; and Mason, clauses Nos. 35, 36 and 38, for stone covering, kerbs and templates.

Linen closet.



The linen closet to be heated with a coil of pipes fixed against the walls, and formed of 1 in. galvanised iron steam tubing placed 6 in. apart, and connected to the 2-in. down return mains with stop and throttle valves. Fix in front of tubing for protection of linen $\frac{1}{8}$ in. galvanised iron wire netting. See Carpenter, clause No. 309.

A linen closet may be heated with ordinary coils.

Painting. See Painter, clauses Nos. 28 and 49.

Labels to pipes. See Painter, clause No. 47.

Temperature. The temperature of the air inside the building is to be from 56° to 60° Fahr. when the external temperature registers 32° Fahr.

Clean out boilers and flues. Clean out the boilers every month and the flues every week.

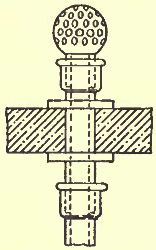
Heating to stables. (**107**)—See clause No. 111.

Fire Hydrants.

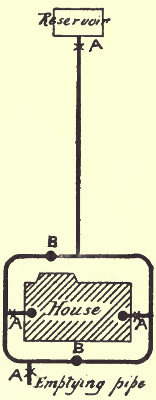
In towns and cities where there is a public water supply fire hydrants may be connected direct with their mains: but in country districts where there is no water supply then hydrants can only be used when there is a storage of water at a high level, so as to enable the water to be thrown with sufficient force against the buildings. See clause No. 112, under Bricklayer, for a storage tank.

Here is a description for a fire hydrant supply to a country house supplied from a storage tank or reservoir at a higher level than the house:—

Fire hydrant supply.



Detail of Rose Connection



(**108**)—Connect to storage tank with a special cast-iron union, and carry down a 3 in. (or 4 in.) heavy cast-iron fire main to building, and continue round the building as a belted main with two 3 in. (or 4 in.) branches into house.

Fix in tank at the outgo of main a movable perforated cast-iron rose, having perforations equal in area to the area of the main itself.

Branch off at lowest point a 3 in. (or 4 in.) pipe for emptying mains, and discharge into ditch near, with a movable perforated iron grating on end.

Put four 3 in. (or 4 in.) full-way sluice valves at points A in small brick in cement chambers, with movable manhole covers on top, but without hinges or locks, and supply a key to each valve.

Take up to top floor of building two separate 3 in. (or 4 in.) heavy cast-iron rising mains with stopped ends.

All mains in ground to be coated inside and out with Dr. Angus Smith's solution, and buried at least 3 ft. deep upon a bed of 6 in. cement concrete 12 in. wide (or the pipes may be bedded on piers similar to iron drain pipes, see notes under clause No. 24, in Drainage).

All mains in the house to be painted inside and out immediately on leaving the casting shop, in two coats of oxide paint, and two coats more when fixed, and decorated to match the other work.

The mains both in the ground and in the house to be jointed with gaskin, and caulked with molten lead with proper caulking tools.

Each of the two ground hydrants at points B to be furnished with:—

- A screw-down valve in brick chamber with cast-iron hinged lid, but no lock.
- One key to open valve and lid.
- One copper stem standpipe with single outlet.
- Two 50 (or 100) ft. lengths copper riveted leather hose, with gun-metal coupling screws, bound in with copper wire, leathered guards and straps.
- One small cupboard fixed in convenient position and painted five oils, with hinges and fastenings, but no lock; and containing one hatchet, two polished hose wrenches, and one copper branch pipe with gun-metal screw and nozzle.

On each floor there are to be two inside hydrants, each hydrant being furnished with:—

- A gun-metal screw-down hydrant with patent screw and wheel handle, cap and chain.

One 30 (or 50) ft. length oak bark tanned canvas hose, inlined with india-rubber, with gun-metal coupling screws bound in with copper wire, leathered guards and straps.

One polished oak hose board fixed in convenient position, and supplied with one copper branch pipe with gun-metal nozzle, two polished hose wrenches, one hatchet, and the necessary fixings.

Three copper riveted leather fire buckets (painted and varnished, with monogram or crest engraved on), and fixed on a polished oak rail with pegs.

One 1 in. gun-metal draw-off cock under the hydrant.

Two of the rooms to be each supplied with a "ladies' boudoir set," consisting of a pump, two buckets and stand.

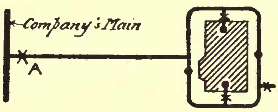
For fire bell, see Bellhanger, clause No. 7.

Perform all excavating, filling in, cutting away and making good to all parts and in all positions.

No pipes are to be covered up until the architect shall have inspected, tested, and found them to be watertight.

If the vertical mains in the house be in chases, they should have vertical gratings in front similar to hot-water pipes, see clause No. 106, with the sketch at the top of page 365.

When the hydrants to a house are supplied from a public water company, a valve A must be put near the connection for repairs.



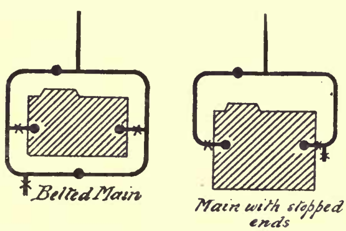
The inside vertical mains may be galvanised inside and out, and decorated to match the other work on the outside.

The hose to the inside hydrants may be double substance, oak bark tanned canvas hose, with gun-metal coupling screws bound in with copper wire and leathered guards and straps; but this class of hose is liable to "sweat" or leak when in use.

The sluice valves are for cutting off the water for repairs to the pipes.

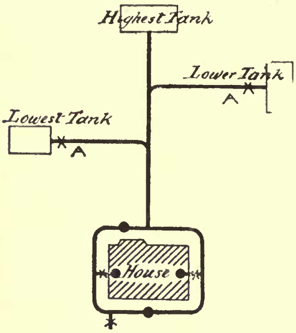
There should be no locks to any portion of fire hydrant fittings, so that they may be accessible at all times.

The advantage in fire mains running round the house in the form of a belt instead of finishing with stopped ends, is that a better supply of water is obtainable by the former method when several hydrants are in action at the same time.



Both when charging and emptying the pipes, take care that it is done very slowly, otherwise the pipes will be subjected to too great a strain and shock. When filling the pipes with water the topmost hydrant should be opened, so as to let the air out.

If fire mains, or in fact any water mains, be supplied from several storage tanks at different levels, there must be a reflux valve A fixed in the pipes in a chamber with cover to each of the lower storage tanks, otherwise the water from the upper tanks would flood the lower tanks.



The length of the hose to the various hydrants should be sufficient to command all that part of the building which it is intended to protect. Frost in this country will not attack pipes when buried 3 ft. deep.

Labels to pipes. See Painter, clause No. 47.

Stables and Fittings.

(Clauses Nos. 109 to 111.)

For sizes of stable yards, see the notes under Pavior, clause No. 11.

For sizes of loose boxes, stalls, passages, and height of stables, see Pavior, clause No. 12.

For sizes of carriages, see Pavior, clause No. 13, which will regulate the size of the coach-house.

For paving to stable yard, stable, cleaning room, harness room and coach-house, see Pavior, clauses Nos. 11, 12 and 13 respectively. A washing box may be paved similar to the cleaning room.

For stable drainage, see clause No. 54, under Drainage.

For sizes of stable gates, coach-house doors, stable and loft doors, see Carpenter, clauses Nos. 266, 267, 270, 271, 272 and 273 respectively.

For special items under the various trades referring to stables, see Mason, clause No. 61; Bricklayer, clause Nos. 67; Painter, notes to clause No. 20; Plumber, notes preceding clause No. 21.

The special gas points required in stables are as follows:—

Single arm fixed gas brackets with galvanised iron wire globes should be fixed in:—

One or two positions in coach-house.
Two or more positions in stable passage in the stable.
One or two positions in washing box, with nozzle for attaching tubing for singeing.
One or two positions in cleaning room.
One or two positions in harness room, with double arm pendant and galvanised iron wire globes.
One or two positions in yard, with lamps, p.c. (say) £1. 10s. each.

Gas should not be put in the loft, it is safer to take a lantern. Also see notes to clause No. 8 in Gasfitter.

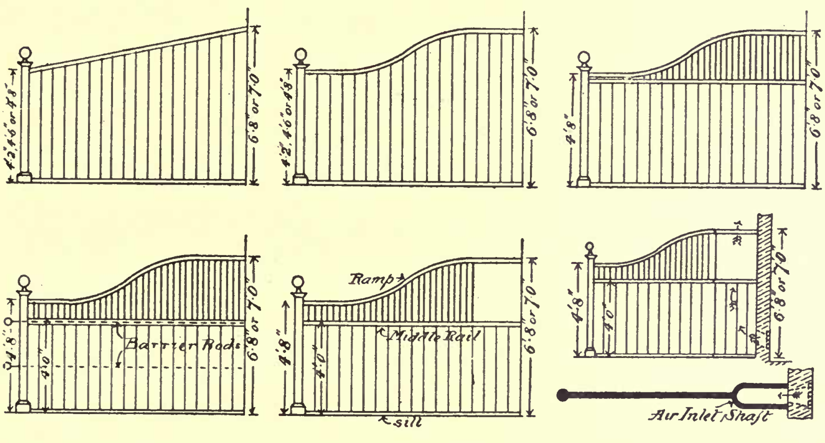
Stables must be freely ventilated and well lighted. The sun must not shine in the horses' eyes or the light be too glaring. If there be living rooms or a hay-loft over the stable, the ceiling should be air-tight, plaster is best for this purpose, but they are often boarded and varnished over, as in clause No. 216 under Carpenter. There must be no projections in stalls or loose boxes against which the horses may be liable to hurt themselves.

In addition to the accommodation required for the horses, stable buildings must have a complete suite of rooms for the coachman and his family; as well as bedrooms for the stable-men, a mess-room and a w.c. A clock is useful when fixed in a prominent position.

It is almost preferable to put a provisional amount for the stable ironwork and fittings and select them afterwards, as they are made in several qualities by the various makers; otherwise some maker should be selected, and the parts and fittings quoted from his catalogue. There are several good makers of stable fittings.

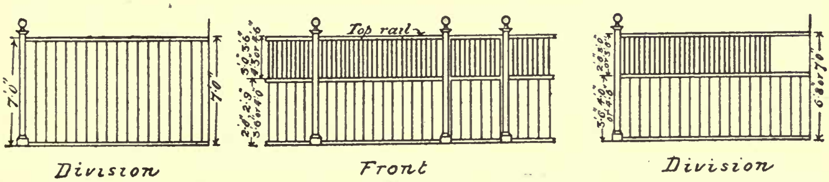
Generally speaking, the ironwork, where in contact with the urine or in wet positions, should be of cast iron; in other parts, in wrought iron.

Here are a few particulars of stall divisions:—



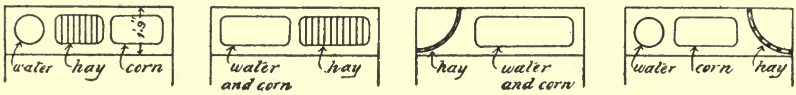
The length of stall divisions may be 9 ft., 9 ft. 6 in., or 10 ft., and either with or without one or two barrier rods. The width between the stalls is 6 ft. or 6 ft. 6 in. Pillars (heel posts) are made $3\frac{1}{2}$ in., 4 in., $4\frac{1}{2}$ in. and 5 in. diameters. Air may be brought into the stable either at the head of the stall division or up the heel posts. The usual height at the head of a stall division is 7 ft., ramping down to 4 ft. 8 in. at the heel.

Here are a few particulars of loose box divisions:—



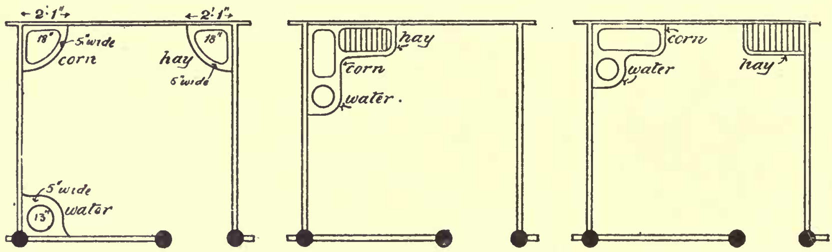
Loose box doors are usually 3 ft. 6 in., 3 ft. 8 in. and 4 ft. wide; if hinged they should open outwards. The pillars are $3\frac{1}{2}$ in., 4 in., $4\frac{1}{2}$ in., 5 in. and 6 in. diameters. The usual height of top rail is 7 ft.

Here are a few particulars of manger fittings to stalls:—



The mangers are fixed 3 ft. 2 in. to 3 ft. 6 in. up, according to the size of the horses.

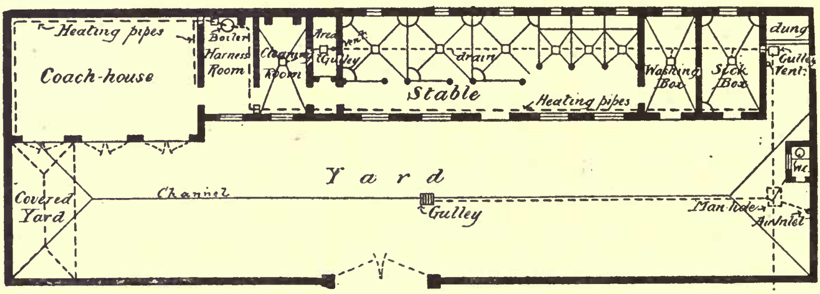
Here are a few particulars of loose box manger fittings:—

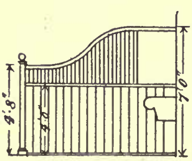


The mangers are fixed at the same height as mentioned to the stalls.

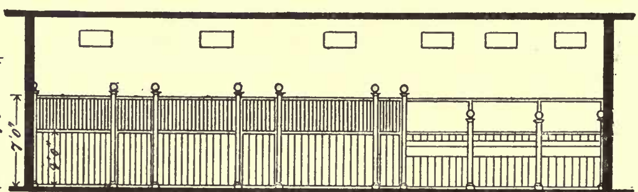
The boarding to loose box and stall division is usually 2 in. thick; and against walls 1 in. thick.

Here is a sketch plan of a stable described in the following clauses Nos. 109 to 111. For drains, see clause No. 54 under Drainage.





Stall division

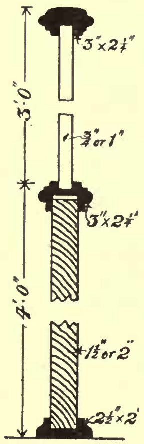


Elevation of Stalls and Loose Boxes

It is useful to allow an extra space in the stable for throwing down the fodder and the storage of blankets.

Generally. (**109**)—The work consists of fitting up three loose boxes, three stalls and one sick box; with the necessary coach-house, washing box, harness room and cleaning room requirements. The ironwork to be neatly fitted together. All fittings to be japanned where not otherwise described, and fixed with screws.

Loose boxes. The loose boxes to be formed with cast-iron pillars 4 in. diameter, with ball tops (say if brass tops), self-fixing cast-iron bases bedded in concrete, and prepared for sliding or hinged doors as the case may be, and with a similar half pillar against the wall. Doors to two of the boxes to be framed up in wrought iron 7 ft. × 3 ft. 6 in., made to slide with wheels, runners, rollers, guides, gearing, and secured with brass latches. The upper part of doors to be filled in with wrought-iron riveted ventilating panelling, and the lower part with pitch pine boarding.



The third loose box door to be similar, but hinged instead of sliding, with wrought-iron hinges and stoppers and brass latch.

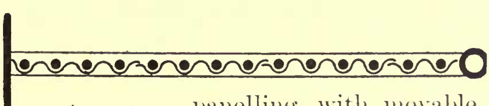
Form the loose box fronts and divisions between the boxes with wrought-iron riveted ventilating panelling at top 3 ft. deep, having moulded wrought-iron top capping, moulded wrought-iron middle rail prepared for 2 in. boarding, and filled in between with ¾ in. wrought-iron bars, 3 in. centres. The lower part to be filled in with boarding fitted in between the middle rail and a cast-iron moulded sill with sliding piece for access to boarding, and bedded on brickwork.

The divisions between the loose boxes to have in addition a wrought-iron solid head-plate 3 ft. (3 ft. 6 in., 4 ft., or 4 ft. 6 in.) long, to prevent the horses seeing one another when racked up,

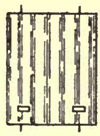
or,

The divisions between the loose boxes may have solid wrought-iron panelling their whole length. This is sometimes necessary with high spirited horses,

or,



The divisions between the loose boxes may have the ordinary open ventilating panelling, with movable galvanised corrugated sheet-iron shuttering in 2 ft. (to 2 ft. 6 in.) lengths, with stubs at top and bottom fitting into corresponding holes in the top capping and middle rail, and provided with two flush handles to each length of shuttering.



Run round the wall sides of loose boxes wrought-iron moulded top capping, wrought-iron middle rail prepared for 1 in. boarding, and cast-iron moulded sill with sliding piece for access to boarding, and bedded on brickwork.

Line round the boarded portion of one of the loose boxes with seven rows of 2 in. $\times \frac{1}{16}$ in. galvanised hoop iron in horizontal lines, every $3\frac{1}{2}$ in. apart, secured with screws every 3 in. apart, and varnished over with the woodwork. (This protects the woodwork when horses are much given to biting.)

Stalls.

The three stalls to be formed with cast-iron pillars $4\frac{1}{2}$ in. diameter, with ball tops (say if brass tops), self-fixing cast-iron bases bedded in concrete, and with a similar half pillar against wall.

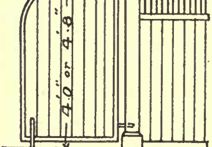
The two centre divisions to stalls to be 9 ft. long, formed with wrought-iron riveted ventilated panelling, 3 ft. deep at head, diminishing to 8 in. deep at heel, with moulded wrought-iron ramp, moulded wrought-iron middle rail prepared for 2 in. boarding, and filled in between with $\frac{3}{4}$ in. wrought-iron bars, 3 in. centres, with a solid wrought-iron head-plate, 4 ft. (3 ft. 6 in. or 4 ft. 6 in.) long at wall end, to prevent the horses seeing one another when feeding. The lower part to be filled in with boarding fitted in between the middle rail and a cast-iron moulded sill, with sliding piece for access to boarding, and bedded on brickwork. The middle rails to be each provided with a wrought-iron sliding barrier rod, with slot fixed to wall on opposite side of passage. (These barrier rods prevent the horses straying about should they get loose. Two barrier rods may be used.)

The wall side of end stall to have a similar moulded ramp and middle rail, and cast-iron sill with sliding piece, prepared for 1 in. boarding, and bedded on brickwork.

Run across head of stalls, wrought-iron moulded top capping, wrought-iron moulded middle rail prepared for 1 in. boarding, and cast-iron moulded sill with sliding piece for access to boarding, and bedded on brickwork.

The top capping is not always put across the heads of the stalls, neither round the wall sides of the loose boxes, but it makes a better finish.

With large horses, 9 ft. is not long enough for the stall divisions, they may then be 9 ft. 6 in. or 10 ft. long.



Existing stall divisions may be lengthened with movable lengthening pieces, say about 4 ft. to 4 ft. 8 in. high, 2 ft. 6 in. wide, formed with 2 in. boarding, filled in between a wrought-iron frame and provided with fixing pins to the posts and a bolt to the floor.

Fill in between the sills and middle rails of loose boxes, stall divisions and loose box doors, with 2 in. picked specially selected small figure wrought both sides pitch pine V-jointed grooved boarding, in 5 in. widths to loose boxes and 4 in. widths to stalls, and tongued together with 1 in. No. 18 gauge galvanised hoop iron tongues. Put similar 1 in. boarding against walls of loose boxes and stalls fixed to $2\frac{1}{2}$ in. × $\frac{3}{4}$ in. fir battens plugged to walls. No coarse figure or deeply coloured wood to be used.

The woodwork may also be in oak or teak, and is sometimes only $1\frac{1}{2}$ in. thick.

The wall spaces in the loose boxes and stalls between the top capping and middle rail may be in enamelled brickwork, similar as described in Bricklayer, clauses Nos. 89 and 87; or in glazed tiles on a cement back, as in clauses Nos. 88 and 89a in Bricklayer. The remaining portion of walls up to the ceiling may be in enamelled brickwork, or else plastered and painted.

It is best to see the coachman and settle with him the number and the class of fittings he requires in—

The loose boxes.
The stalls.
The stable.
The cleaning room.
The harness room.
The washing box.
The coach-house.
The yard.

The following articles are some of those usually required:—

Loose box fittings.

Each loose box to have the following fittings:—

Two enamelled iron loose box mangers with large safety fronts, fixed 3 ft. 2 in. up (to 3 ft. 6 in.) from paving.

One enamelled iron water pot 13 in. diameter, with brass plug flush with bottom, washer and chain, fixed 3 ft. 2 in. (to 3 ft. 6 in.) up from paving.

One japanned iron name-plate frame, with painted glass slide about 16 in. × $2\frac{1}{16}$ in. × $\frac{1}{8}$ in., with name painted on in gold.

One galvanised iron (brass or bronze) racking ring, with galvanised iron chain.

Two galvanised iron dressing rings, with two galvanised iron chains.

One cast-iron ventilator, about 2 ft. 6 in. × 15 in., fixed at head of box, and glazed with 26 oz. clear sheet glass, with a cast-iron grating on the outside.

Two sets of loose box noiseless tyings.

One stench strap 11 in. (or 14 in.) square (if underground drains).

See the sketches in the notes preceding this clause for the various kinds of loose box fittings.

It is a better plan to put in a p.c. amount to each of the above items.

In loose boxes, hay and grass are often thrown down on the floor for the horses to feed off; if a hay rack be required state so.

Stall fittings. Each of the three stalls to be fitted up with:—

One stall manger with tubular front, fixed 3 ft. 2 in. (to 3 ft. 6 in.) up from paving, and combining an enamelled iron feeding trough, enamelled iron water pot, 13 in. diameter, with brass plug flush with bottom, washer and chain, and wrought-iron hay rack.

One japanned iron name-plate frame, with painted glass slide about 16 in. × $2\frac{1}{8}$ in. × $\frac{1}{8}$ in., with name painted on in gold.

One galvanised iron (brass or bronze) racking ring, with galvanised iron chain.

Two galvanised iron (brass or bronze) dressing rings, with two galvanised iron chains.

Two galvanised iron (brass or bronze) pillar rings, with two galvanised iron chains.

One cast-iron ventilator about 2 ft. 6 in. × 15 in., fixed at head of stall, glazed with 26 oz. clear sheet glass, with a cast-iron grating on the outside.

Two sets noiseless tyings.

One stench trap 11 in. (or 14 in.) square (if underground drains).

Two kicking mats with dyed border, and fixed with bolts, nuts, heads and washers.

See the sketches in the notes preceding this clause for the various kinds of stall fittings.

It will be better to give a p.c. amount for each of the above items.

Stable fittings. The stable to be provided with the following fittings:—

One cast-iron niche and trap (usually 18 in. wide × 2 ft. 6 in. high) fitted flush into one of the walls, having a $\frac{3}{4}$ in. gun-metal cock with nozzle, and 30 ft. of red india-rubber hose with spreader and connections, and lay on $\frac{3}{4}$ in. lead supply. (The rubber hose may be wired on the outside.)

(Say) six teak buckets painted white inside, dark blue outside and initialled.

(Say) three stable forks with polished ash handles and brass ferrules, and initialled.

(Say) two stable brooms with polished ash handles, and initialled.

(Say) two wrought-iron fork and broom racks for three forks and two brooms each.

(Say) six folding brackets with polished wood cappings.

(Say) one japanned brush and sponge drainer.

One long arm with polished ash handle and brass hook, for opening and closing ventilators.

(Say) three straw plait holders.

If a window look into a loose box or stall, take a wrought-iron window guard.

P.C. amounts may be put to each of the above items.

Cleaning room fittings.

(Say) six folding brackets, all in japanned iron.

(Say) one japanned brush and sponge drainer.

(Say) one wrought-iron telescopic harness cleaning hook, leathered.

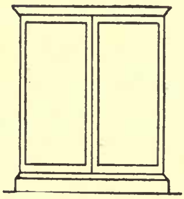
One wrought-iron cleaning horse.

One gully trap.

The harness is cleaned in this room before it is taken into the harness room.

The floor would be paved, the walls may be of plain brick, or plastered and painted. The ceiling may be boarded or plastered.

Harness room fittings.



(Say) six sets ventilating brackets, with polished wood cappings for double harness.

(Say) six do. do. do. for single harness.

(Say) two do. do. do. gent.'s saddle and bridle do.

(Say) two do. do. do. lady's do. do.

One pitch pine polished cleaning horse with drawer, flaps and cupboard.

(Say) one gent.'s oak saddle airer.

One polished pitch pine bit case, 4 ft. × 4 ft. 6 in. × 6 in. deep, with 32 oz. sheet (or plate) glass doors, brass hinges, bolts and lock; and lined on the inside with blue cloth, and provided with say one dozen brass bit and curb hooks with rosettes.

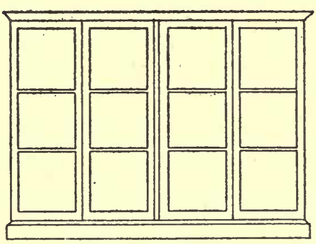
(Say) one wrought-iron telescopic harness cleaning hook, leathered.

(Say) one whip rack for three whips.

A harness room is merely for hanging up the harness in when clean, and only dry cleaning should be done in it.

A harness room is generally lined round with boarding; see Carpenter, clause No. 216.

The bit case is usually fixed over the mantelpiece.



Sometimes the harness is kept in cupboards; these may be in similar framing as to cupboards mentioned in Carpenter, clause No. 293 modified, or the doors may be glazed. Of course shelves are not required.

Washing box.

A washing box is a place for washing the horses under cover.

The floor should be paved, with a gully in the centre; the walls be of brick, and the ceiling either wood or plaster.

The only fitting required is a galvanised iron racking ring.

Coach-house fittings.

One niche exactly similar in every way to that described in the stable, but sometimes two 30 ft. lengths of the india-rubber hose are required.

(Say) three sets of wrought-iron carriage pole hooks, leathered.

Yard.

One movable strong framed galvanised iron wire manure guard, 5 ft. × 4 ft. × 3 ft. (or 6 ft. × 3 ft. × 3 ft.) secured to eyes fixed in the wall.

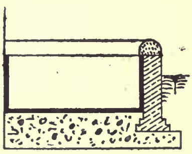
Fix to wall (say) three galvanised iron yard rings.

Manure guards are also made 4 ft. × 3 ft. × 2 ft. 6 in.; 4 ft. × 3 ft. 6 in. × 2 ft. 9 in; 4 ft. 6 in. × 4 ft. × 3 ft.; and 5 ft. × 4 ft. × 3 ft. 6 in.

A draw off may be required in the yard, if there be no niche in the stable.

If there be a dung pit a manure guard will not be required.

It is a good plan to cover part of the yard in with a light iron framed and glass roof, similar to clause No. 29, so that either horses or carriages may be washed under cover.

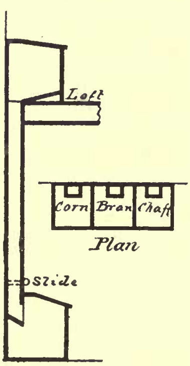


If a dung pit be required it should be built with brick in cement on concrete, and coped with rounded York stone or blue bricks in cement. The inside must be lined in Portland cement and sand $\frac{3}{4}$ in. to 1 in. thick, finished off in $\frac{3}{8}$ in. neat cement.

Loft.

Corn, bran and chaff store (bins).

Form corn store bin in loft with $1\frac{1}{2}$ in. (to 2 in.) wrought deal matched and beaded boarding, with 7 in. × $1\frac{1}{2}$ in. wrought ledges outside, and two $1\frac{1}{4}$ in. divisions inside. The bottom to be formed to a sharp slope to the shoots. Carry separate 1 in. (or $1\frac{1}{4}$ in.) wrought framed deal shoots from each division of store, and connect to a similar store or bin in stable below. The tops to be hinged with strap hinges. Line the inside of the bins (but not the divisions) with No. 13 gauge zinc, soldered together at joints, and copper nailed along top edge.



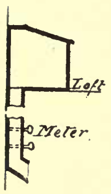
Each shoot to have an iron shutter slide near the store bin in stable.

For space corn occupies, see notes preceding clause No. 46 in Carpenter.

The shutter slide is for stopping the supply from the upper store bin to the lower. State how many bushels the bins are to hold.

The shoots from the corn and bran store may be about 8 in. × $4\frac{1}{2}$ in., and for the chaff not less than 12 in. × 12 in.; they may each be lined with zinc.

The store bins may also be in brickwork, rendered over on the inside in cement, and covered over with wooden covers.



When there is no separate corn bin in the stable, an iron corn bin may be fixed in the loft, with a shoot to the stable below, with a meter. The meter consists of two shutter slides, so that a measure of corn may be obtained each time. State the size of bin; they may be had to hold 4, 6, 8, 10 and 12 bushels. Bran and chaff bins would be similar.

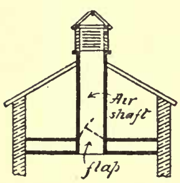
Hay shoot from loft.

Form hay shoot from loft to stable below with 4 in. × 2 in. stud framing, lined inside and out with 1 in. matched and beaded boarding, with two sets of folding dwarf doors, one being from the loft into the shoot, and one from the stable into the shoot, and provided with hinges and fastenings.

A hay shoot may be built in brickwork.

For space trusses of hay and straw occupy, see notes preceding clause No. 46 in Carpenter.

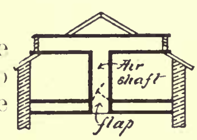
Exhaust ventilator.



From ceiling level of stable carry a 2 ft. 6 in. × 2 ft. 6 in. timber framed exhaust ventilator to roof turret formed with 4 in. × 2 in. stud framing, and lined on the inside with 1 in. wrought deal matched and beaded boarding, having a ledged door formed in it on one side, with hinges and fastening for access to the trap door at the ceiling level. Describe the trap door as clause No. 276 in Carpenter.

For roof turret, see Carpenter, clause No. 97.

Instead of the ventilator being connected to the roof turret, it is a good plan to form it with two outlets, furnished with louvres at each end, see Carpenter, clause No. 99.



Sick box.

A sick box should be entirely separated from the stables and entered from the outside. Describe the paving, iron sill, iron middle rail, and the boarding, similar to a loose box; the walls above should be in enamelled brickwork or tiles, and the ceiling plastered and painted.

The following fittings would be required as in a loose box, which will be found fully described under loose box fittings:—

Two mangers.
One water pot.
One name-plate frame and name plate.
One racking ring and chain.
Two dressing rings and chains.
One ventilator.
Two sets tyings.
One stench trap.
One set slinging apparatus (from £10 to £20).
One wrought-iron window guard against window.

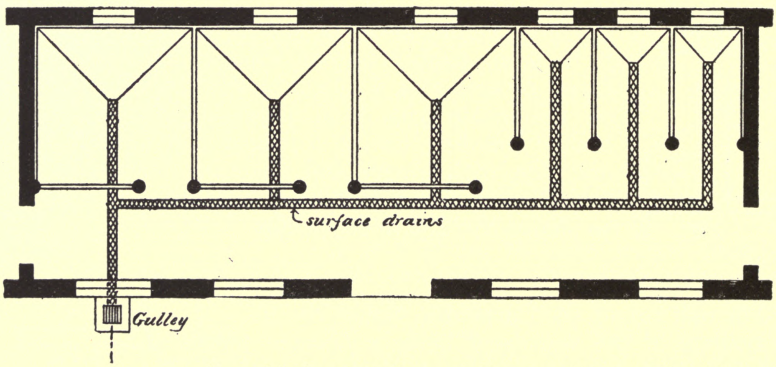
Painting to fittings.

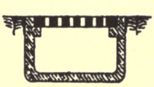
Paint all ironwork one coat in oil colour before it leaves the makers, and two (or three) coats when fixed, and twice varnish in copal.

Twice size and twice varnish in copal, all woodwork to boxes and stalls.

Surface gutters in stables.

(110)—If instead of the stench traps in the loose boxes and stalls, surface gutters be required as mentioned in the notes to Pavior, clause No. 12, and under Drainage notes to clause No. 54; then describe as:—

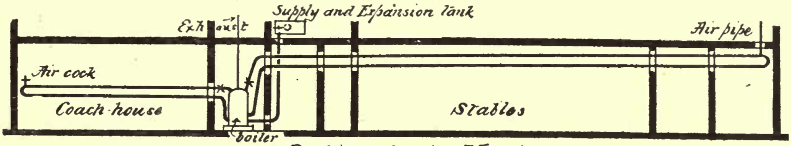




Lay 4½ in. cast-iron surface gutters with all angles, tees and sliding covers, and carry up each of the loose boxes and stalls to within a short distance of the head. Take similar guttering with cover along the passage in front, but having a fall formed in the bottom of the guttering, and finish with a flap before discharging into the outside gully.

Surface gutters are also made 5 in. and 6 in. wide.

Heating. (**111**)—Fix in harness room an independent dome top boiler with flue, (say) p.c. £12. Take $1\frac{1}{2}$ in. flow and

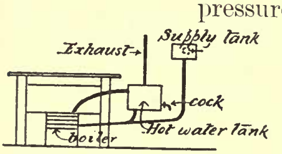


Section shewing Heating

return with valve, across cleaning room to stables, and continue along the passage wall of stable above the head of the windows as far as the end of sick box, with 3 in. (or 4 in.) flow and return pipes finished with a $\frac{1}{2}$ in. air pipe at the highest point. Take a similar $1\frac{1}{2}$ in. flow and return pipe, but with two valves, across harness room to coach-house, and continue round the three sides about 4 ft. up from the floor with 3 in. (or 4 in.) flow and return pipes, furnished with an air-cock at the two highest points. Protect pipes from harness in harness room, with wrought deal beaded casing on bearers. Put 1 in. exhaust pipe from top of boiler. Lay on $\frac{1}{2}$ in. lead water supply with ball-cock to a 20 gallon galvanised iron supply tank on bearers, and carry down $\frac{3}{4}$ in. supply to boiler. Put 1 in. overflow pipe to cistern with lead safe and dribble pipe, and case in (see under Plumber, clause No. 30). Allow the p.c. sum of £1. 10s. for an iron mantelpiece. Put all pipe and cistern brackets, bearers, connections and fittings.

For the jointing of pipes, see under clause No. 106. It is not intended to draw off water from this boiler.

Hot water. Fix in cleaning room an open fire stove with high-pressure circulating boiler at back, (say) p.c. £9. Take 1 in. flow and return pipe to a 20 gallon circulating tank near, with gun-metal draw off cock, and 1 in. steam pipe exhaust. Lay on $\frac{1}{2}$ in. lead supply terminated with a ball-cock into a 5 gallon supply tank with 1 in. overflow, and take down 1 in. supply to boiler. Allow £1. 10s. p.c. for an iron chimney-piece.



The hot mash is made up on this open fire. An ordinary open fire, with open side boiler, may be used in small stables.

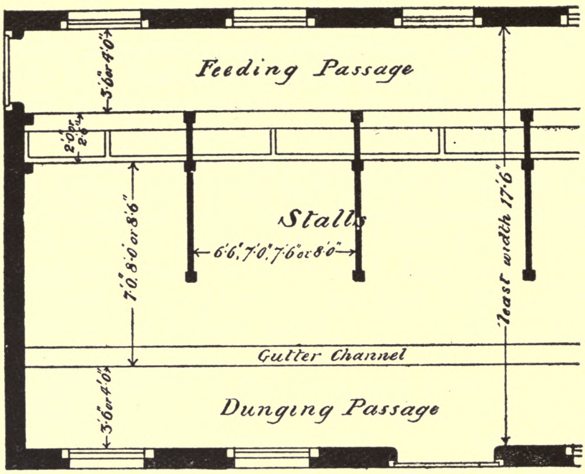
Cow Houses.

Cow-house stalls are also called "lairs" and "byres."

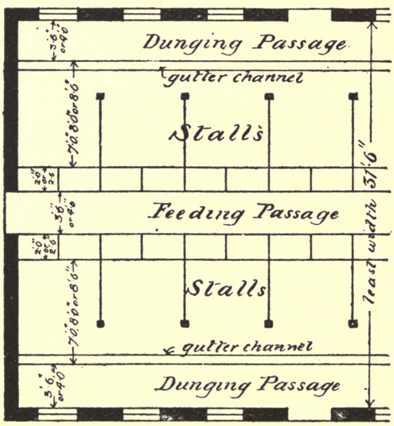
Cow-house fittings. (**112**)—Here are a few particulars about cow-house fittings:—

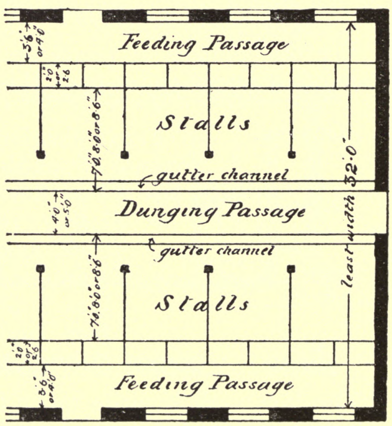
The "feeding passage" may be 3 ft. 6 in. or 4 ft. wide; the manger fitting, 2 ft. to 2 ft. 6 in. wide; the bed or standing space, from the manger to the outer side of the drain channel, 8 ft. 6 in. long (with very small cows it may be as little as 7 ft.); the "dunging passage" 3 ft. 6 in. to 4 ft. wide.

Here is a sketch of a single cow-house, showing the least total width suitable for ordinary size cows, to be 17 ft. 6 in. in the clear.



Here are two sketches, showing alternate ways of arranging a double cow-house; the least total width being 31 ft. 6 in. and 32 ft. respectively

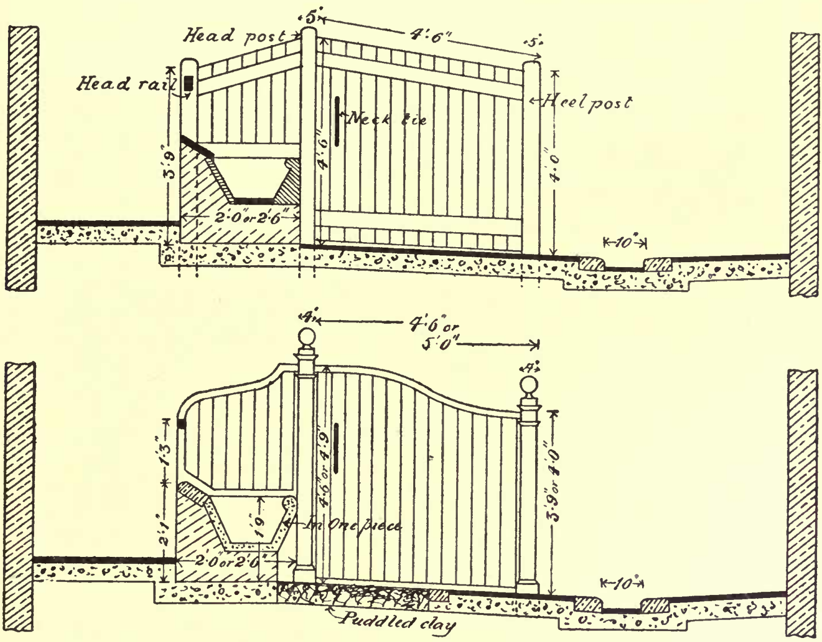




in the clear. When the dunging passage is in the centre, it may be made as much as 5 ft. wide.

When two cows are accommodated in the one stall, the stall divisions (travises) are placed at 6 ft. 6 in., 7 ft., 7 ft. 6 in. and 8 ft. centres, but 7 ft. is a very serviceable width. When cows are placed singly in each stall, then the divisions may be placed at 4 ft. or 4 ft. 6 in. centres.

Here are two sketches of stall divisions, the one being framed up entirely in wood, the other in wood and iron. The thickness of the

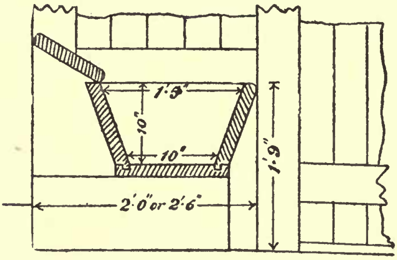


woodwork should be 1½ in., either in spruce or pitch pine. All arrises in the timber stall divisions must be rounded off. Stall divisions are also made entirely in iron.

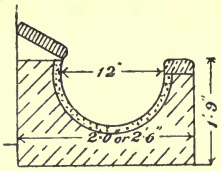
The floor or standing space of the stalls may fall 2 in. to 3 in. from the manger to the drain channel, and be paved with asphalt or cement on concrete, as in Pavior, clause No. 7, and finished with bull-nosed Staffordshire blue brick nosing on both sides of the drain channel, the channel being 10 in. wide and paved with 10 in. × 1 in. plain blue brick paving bricks, and discharging out into the open without traps. The standing space is sometimes paved with large flat stones with few joints, the great object being to get a standing space with few or no joints. Puddled clay may be placed for a distance of about 3 ft. 6 in. at the head of the stalls by about 9 in. to 12 in. deep, and the concrete should be placed underneath the clay.

This puddled clay forms a soft bed for the cows to rest upon when getting up or lying down. The dunging passage may be formed with asphalt, concrete, stone or brick. The feeding passage may be plain earth, or else paved in any class of paving; it is usually placed at a slightly higher level than the floor of the stalls.

The mangers may either be in wood, in one long range the whole length of the cow-house, with an out-



let and plug at one end for cleansing purposes, or else formed in a similar way with glazed half pipes or glazed brick blocks. The mangers may be entirely separate to each stall without communicating with one another.



When the stall contains a single cow only, the manger may be in one piece of glazed fireclay. The height of the manger from the floor varies, but 1 ft. 9 in. is a very suitable height. The slanting piece at the back of the manger is to allow room for the horns of the cows when feeding. The head-rail at the head of the stalls is to prevent the cows getting their heads too far out into the feeding passage. When the cows are in the stalls they are chained up to an 1 in. iron bar neck tie, about 2 ft. long, fixed to the stall division.

The walls may be in brick or stone, the inner face being limewhited over unless it be in glazed brick. When in plain brick or stone, the walls may be cemented over against the dunging passage for a height of about 5 ft., and finished a trowelled face in neat Portland cement. This will allow that part of the walls to be periodically washed down.

All sharp arrises should be taken off both to brick, stone, wood or other material.

For windows, see Carpenter, clause No. 178.

For doors, see Carpenter, clause No. 272. The doors should not be less than 4 ft. wide in the clear, and hung in two halves.

There should be an abundance of light and ventilation in a cow-house. In addition to the ventilation and light obtained from the louvred windows described in Carpenter, clause No. 178, there should be a louvred skylight in the roof.

Air inlets with hit-and-miss gratings may also be placed in the passage walls opposite each stall. Cows should be provided with 12 gallons of water per head.

The London County Council require each cow stall to be 8 ft. × 4 ft. for one cow, and 8 ft. × 7 ft. for two cows. The cubical contents of the cow-house to be 600 cub. ft. per cow, and sometimes 800 cub. ft.; not more than 16 ft. in height is to be reckoned in these amounts. The walls to be cemented up 5 ft., or to be in similar impervious material. Twelve gallons of water are to be provided per head.

Iron hurdles and gates.

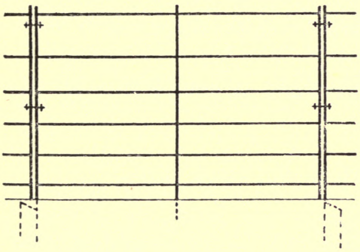
(**113**)—Iron hurdles are made 6 ft. long by 3 ft. 3 in., 3 ft. 6 in., 3 ft. 9 in., 4 ft. and 4 ft. 6 in. high, with three, four, five and six bars.

Hurdles 3 ft. 3 in. high have three or four bars, $\frac{5}{8}$ in. top and $\frac{1}{2}$ in. lower horizontal bars; the middle and end uprights being 1 in. × $\frac{1}{4}$ in.

Those 3 ft. 6 in. and 3 ft. 9 in. high have five horizontal bars, the top bar being $\frac{5}{8}$ in. diameter, the lower bars $\frac{1}{2}$ in. or $\frac{5}{8}$ in. diameter, or else in flat iron 1 in. × $\frac{1}{4}$ in. The middle upright (one or two) $1\frac{1}{2}$ in. × $\frac{1}{4}$ in., and the end uprights $1\frac{1}{4}$ in. × $\frac{5}{16}$ in.

Those 4 ft. and 4 ft. 6 in. high have six horizontal bars, the top bar being $\frac{3}{4}$ in. diameter, the lower bars either $\frac{5}{8}$ in. diameter or else in flat iron 1 in. × $\frac{1}{4}$ in., the middle upright (one or two) $1\frac{3}{4}$ in. × $\frac{3}{8}$ in., and the end uprights $1\frac{1}{2}$ in. × $\frac{3}{8}$ in.

Here is a description:—



Fence round the field with iron hurdles. Each hurdle to be 6 ft. long, 4 ft. high above ground, and formed with two $1\frac{3}{4}$ in. × $\frac{3}{8}$ in. middle uprights, slightly rounded on top and with pointed feet 6 in. long; end uprights $1\frac{1}{2}$ in. × $\frac{3}{8}$ in., slightly rounded on top, with single-pronged pointed feet 12 in. long; $\frac{3}{4}$ in. round iron horizontal top bar, and five $\frac{5}{8}$ in. round iron lower bars forged into the middle and end uprights, and the whole finished with jet varnish.

The hurdles to be fixed together just below the top horizontal bar and between the third and fourth horizontal bars with $\frac{3}{8}$ in. galvanised iron bolts $1\frac{1}{2}$ in. long between the head and the point, and provided with $\frac{1}{4}$ in. thick square heads and nuts.

The feet may be tarred and the upper part painted instead of being finished with the usual black varnish. Iron hurdles are also entirely tarred over.

For green wood hurdles, see Carpenter, clause No. 329.

There are many and varied kinds of wire fencings.

Gates. Wrought-iron field gates are made 9 ft. long, with fixing posts and fittings. Side gates are made 3 ft. 6 in. wide.

SLATER.

(Including Slate Mason.)

Slates. (**1**)—The slates to be whole, even in thickness, hard, tough and smooth, free from patches, spots, cracks, veins, shakes and other defects, reduced to equal widths, squared up and dressed, and giving a clear ring when struck. The slating to be properly bonded in every part. No slates to be laid lengthwise. Perform all cutting and labours.

Double courses. (**2**)—Put a double course of slates at eaves.

Leave watertight. (**3**)—Leave slating watertight at completion of the building.

Clean out gutter and pipes. (**4**)—Clean out all gutters and stack pipes.

Large slates should be laid to a pitch of about 22°, or height of roof $\frac{1}{5}$ of span.

Ordinary slates (such as Countess) should be laid to a pitch of about 27°, or height of roof $\frac{1}{4}$ of span.

Small slates (such as Ladies) should be laid to a pitch of about 30°, or height of roof $\frac{1}{3}$ of span.

It is usual to make the pitch at 30° in ordinary work.

Queens and Rags are 36 in. × 24 in.; Imperials, 30 in. × 24 in., and are sold by the ton.

Empress are 26 in. × 15 in.; Princess, 24 in. × 14 in.; Duchess, 24 in. × 12 in.; Marchioness, 22 in. × 12 in.; Countess, 20 in. × 10 in.; Viscountess, 18 in. × 10 in.; Ladies, from 16 in. × 10 in. to 14 in. × 7 in.; Doubles, 13 in. × 10 in.; Smalls, from 12 in. × 8 in. to 10 in. × 5 in.; all of which are sold by the 1000.

Roofs. (**5**)—Cover the main roofs and outbuildings with close-jointed Bangor purple Countess slates, best quality, laid to a 3 in. lap at 30° pitch. The horizontal and vertical joints to range perfectly straight, and the slates to be cut and dressed to ridges, gables, hips, valleys and verges. Each course of slates to be laid flat on a previous course and properly bonded in every part. Each slate to be about $\frac{1}{6}$ in. thick and fixed with two $1\frac{1}{2}$ in. copper nails, 6 lbs. per 1000, upon $2\frac{1}{2}$ in. × $\frac{3}{4}$ in. horizontal fir battens spiked on to $2\frac{1}{2}$ in. × $\frac{3}{4}$ in. (or 1 in.) fir cross battening running from ridge to eaves, spaced 12 in. apart, and spiked through the felt to the boarding beneath.

In a curb roof, part of the slating would necessarily be laid to a greater pitch than 30°.

See notes generally under clause No. 6.

Cheeks of dormers.

(**6**)—Lay similar slating, felt and battens to cheeks of dormers.

The cross battening mentioned in clause No. 5 gives better ventilation under the slates. It is only provided in first-class work.

Often on boarded roofs no slate battens are used, the slates being nailed direct to the boarding.

If the slates be only fixed to the ordinary battens without boarding, as is often the case, they may be "torched" on the under side in lime and hair mortar against the battens: or they may be "shouldered" in lime and hair mortar coloured with ashes. Shouldering is bedding the heads of the slates only, about 2 in. down.

If Bangor slates be not used, state the kind, such as Penrhyn blue or Westmoreland green: if "Countess" size be not used, then state the size, such as Duchess (24 in. × 12 in.), Ladies (16 in. × 10 in.), or other size.

State if the slating is laid in promiscuous sizes; or in diminished courses from eaves to ridge; or partly in ornamental courses, such as every four courses alternately.

Very small slates have to be used in circular slating.

If the ordinary lap of 3 in. be not required, then give the lap, such as $2\frac{1}{2}$ in. or $3\frac{1}{2}$ in.; but in very steeply pitched roofs, such as those at 60° or more, then a less lap than $2\frac{1}{2}$ in. will suffice, and even as low as an $1\frac{1}{2}$ in. lap in some positions.

Battens may also be 2 in. × 1 in., or $2\frac{1}{2}$ in. × 1 in.

If copper nails be not used, state the class, such as composition, zinc, cast or malleable iron nails; and if either of the two latter class of nails be used, then state that they are to be either galvanised or dipped in boiled oil. If slates are to be screwed with brass or copper screws, state so.

$1\frac{1}{2}$ in.	copper	nails weigh about	. 6	lbs. per 1000.
2 in.	,,	,, ,,	. 10	lbs. ,,
$1\frac{1}{2}$ in.	composition	,, ,,	. $6\frac{1}{2}$	lbs. ,,
$1\frac{3}{4}$ in.	,,	,, ,,	. 8	lbs. ,,
$1\frac{1}{2}$ in.	zinc	,, ,,	. $4\frac{1}{2}$	lbs. ,,
$1\frac{3}{4}$ in.	,,	,, ,,	. 7	lbs. ,,
2 in.	,,	,, ,,	. 11	lbs. ,,

Glass slates.

(**7**)—Allow for (say) 20 glass slates in roofs, of $\frac{1}{8}$ in. ribbed plate, screwed to the battens, and the roof boarding cut through to allow the light to penetrate.

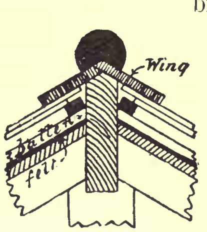
Also see Glazier, notes to clause No. 3.

Felt.

(**8**)—Lay over the surface of all boarded roofs under the slate battens best asphalted (or inodorous) roofing felt about $\frac{1}{8}$ in. thick, properly passed, lapped and tacked on every 3 in. apart with $1\frac{1}{8}$ in. clout nails, 5 lbs. per 1000 (or 1 in. copper nails).

Sarking felt may also be used. Felt is sometimes lime-whited over before the battens are spiked on. Felting a roof adds to the warmth in winter and the coolness in summer of the rooms below.

Hip and ridge rolls.



(**9**)—Put 2 in. diameter Bangor slate, rounded, and bird's-mouthed hip and ridge rolls, with 6 in. $\times \frac{3}{8}$ in. sawn slate wings in long lengths, and sawn at edges and ends, even in thickness, and bedded in oil putty.

The wings to be fixed with $2\frac{1}{2}$ in. brass (or copper) screws, and the hip and ridge rolls with 3 in. brass (or copper) screws, countersunk at heads and stopped in with oil putty (or cement).

Sometimes the roll is formed on the one wing, the other wing being separate.

The ridge may also be formed with red tile ridging, see Tiler, clause No. 4, but when employed with slate roofing it looks common.

The valleys are usually formed in lead and sometimes in zinc, see Plumber, clause No. 11. The hips and ridges may also be formed in lead, and this makes the best work, see Plumber, clause No. 11.

Blue tiles are sometimes used for the hips and ridges, but they make poor work.

Mitred hips or valleys.

The hips and valleys to be cut and mitred together, and carefully dressed over the secret gutters, as also to the rakes of roof against walls, chimney stacks, dormers, traps and skylights.

Valleys are seldom mitred together.

This latter paragraph is only required when secret gutters are used in a roof to all the intersections and rakes, see Carpenter, clause No. 80, and Plumber, clause No. 11.

Filleting.

(**10**)—Run cement filleting as flashings to the roofs of back additions. (See Bricklayer, clause No. 92.)

Filleting is only used in inferior roofing in place of lead flashings. But with flashings against stone walling which is too hard to cut, and having no bed such as in random rubble walling, as mentioned in Mason, notes preceding clause No. 104, then cement filleting becomes essential.

Verges.

(**11**)—Bed and point verges in cement.

Open slating.

(**12**)—Cover the temporary sheds with Bangor Countess open slating, with joints 2 in. apart. Each slate to be fixed with two $1\frac{1}{2}$ in. composite nails, and laid to a $2\frac{1}{2}$ in. lap on $2\frac{1}{2}$ in. $\times$ $\frac{3}{4}$ in. fir battens spiked to rafters.

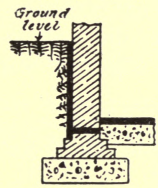
Open slating consists in laying the vertical joints about 2 in. apart, but is only used in very inferior or temporary work. The hips, ridges, valleys, verges and filleting would follow as in ordinary slating, see clauses Nos. 9 to 11.

Vertical slating.

(**13**)—Slate the south-west side of house with similar slating as described to roofs, but bedded in mortar (or cement) and tacked on to $2\frac{1}{2}$ in. $\times$ $\frac{3}{4}$ in. fir battens plugged to walls. There is to be no felt or boarding.

This class of slating is used in exposed situations on vertical walling where subject to much wet.

Prevention against damp walls.



(**14**)—Lay a double course of Bangor Countess slating, in neat Portland cement, against the basement walls of building where the ground abuts.

The brickwork to be roughly rendered over in cement and sand in equal proportions in the first place.

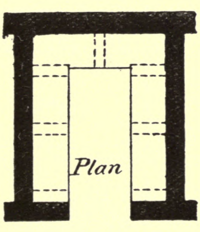
Also see Plasterer, clause No. 64. If asphalt be used, see Bricklayer, clause No. 43.

Slate Mason.

(Clauses Nos. 15 to 22.)

A cubic foot of slate weighs from 157 to 180 lbs.
Slate 1 in. thick is equal in strength to Portland stone 5 in. thick.

Wine cellar.

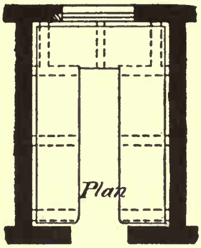


(**15**)—Put round three sides of wine cellar two tiers of 1 in. sawn Bangor slate slabs 2 ft. wide, with sawn edges and butt jointed, and bedded on half-brick division walls built in cement every 5 ft. apart.

Pin in the edges of the slate slabs into walls in cement.

See clause No. 301 in Carpenter, for decanting bench.
Iron wine bins are frequently used in lieu of slate shelving, for which a p.c. sum may be allowed. Patent terra-cotta "honeycomb" wine bins are very good.

Larder (butter, milk and pastry).



(**16**)—Put round three sides of larder three tiers of 1 in. rubbed (or sawn) Bangor slate slabs, with sawn back edges, rounded front edges and corners, and joints rebated together in oil cement, and bedded on white enamelled double bull-nosed one brick thick division walls, built in cement every 5 ft. apart.

The slabs to be kept 1 in. clear of the walls for ventilation.

See Carpenter, clause No. 153, for fly netting and louvres to windows, and Carpenter, clause No. 298, for meat hangers.

For ice chamber or cold store, see Carpenter, clause No. 335.

Frequently the first shelf only is of slate, the remaining ones being in wood; see Carpenter, clause No. 297.

For meat and game larder, see Carpenter, clause No. 298.

Slate slabs may be bedded on to cut and shaped slate bearers, about 2 in. wide $\times 3\frac{1}{2}$ in. deep, pinned into walls every 3 ft. apart in cement, or they may be fixed upon iron brackets pinned into walls.

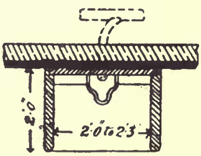
The front edges may be rubbed square or slightly bevelled off, and the jointing of the slabs may be grooved and tongued together with 1 in. $\times \frac{1}{8}$ in. copper tongues in oil cement.

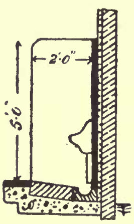
The back edges are sometimes pinned into the walls, and in this case slate skirting may be fixed round the walls on the lower shelf as a protection for the plaster.

The description would run:—

The first tier of shelving to have a 6 in. $\times \frac{3}{8}$ in. sawn (or rubbed) Bangor slate skirting against walls, drilled and screwed with brass (or copper) screws, countersunk and plugged to walls, and bedded in oil cement.

Urinal.





(**17**)—Put 1 in. white enamelled Bangor slate slab sides and back to urinal, 5 ft. high by 2 ft. deep, with rounded edges, quadrant-shaped corners at top, rebated and jointed together with red lead (or oil) cement, cut into the plaster and flooring, and screwed to plugs in wall with $\frac{1}{2}$ in. copper (or brass) screws, countersunk. See Plumber, clause No. 56, for the urinal basin.

Form floor in white enamelled brickwork in cement, with a fall of 3 in. to the back to a small slate channel, falling both ways to the gully.

Urinal slabs are enamelled to represent marbles of many kinds.

The floor may be formed on a 4 in. concrete bed, rendered over with cement and sand $1\frac{1}{4}$ in. thick, and finished a trowelled face in $\frac{3}{8}$ in. neat cement.

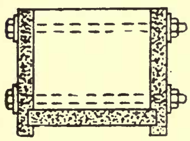
For a range of urinals, see Plumber, clause No. 56.

Slate chimney pieces.

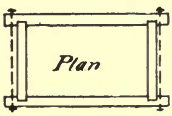
(**18**)—A p.c. amount is generally allowed for these, and they are usually enamelled.

For other chimney pieces, see Mason, clauses Nos. 53 and 124; Carpenter, clause No. 215; and Smith, clause No. 74.

Slate cisterns.

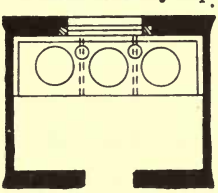


(**19**)—To be 3 ft. × 4 ft. × 2 ft. 6 in. deep (or other size), and formed with 1 in. (to 2 in.) planed one side Bangor slate slabs, grooved at angles and bottom, and put together with red lead cement, and four $\frac{1}{2}$ in. (to 1 in.) galvanised iron rods, nuts and washers. Drill the holes for the rods and pipe connections.

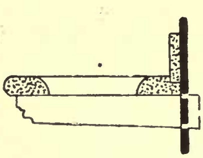


Slate cisterns are very sanitary.

Slate lavatory top.



(**20**)—To be an 1 in. rubbed one side Bangor slate slab, rounded on front edge, with holes cut for elliptical (or circular) basins with a thumb-moulded rim (and perhaps rebated on the under side for basins), and fixed on 2 in. × $3\frac{1}{2}$ in. cut and shaped slate bearers every 3 ft. apart pinned into walls. Form slightly dished circular (or elliptical) shaped soap sinkings.

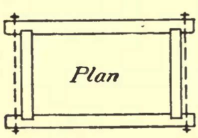


Run a 6 in. × $\frac{1}{2}$ in. rubbed slate skirting round three sides, with quadrant-shaped corners, and let into a rebate in the lavatory top, and at the angles in red lead (or oil) cement, and fixed with $\frac{1}{2}$ in. brass (or copper) drilled screws, countersunk and plugged into walls.

The bearers may be galvanised iron brackets.

For marble lavatory top, see Plumber, clause No. 36 and notes.

Slate sinks.



(**21**)—To be in $1\frac{1}{4}$ in. slate 4 ft. × 2 ft. × 6 in. (to 4 in.) deep (or other size) square (or rounded) on top edges, planed (or rubbed) on inside, sawn on outside, grooved together in red lead cement, and secured at the ends with two $\frac{1}{2}$ in. (or $\frac{5}{8}$ in.) galvanised iron rods and nuts; and perforated for waste pipe.

For sleeper walls, see Bricklayer, clause No. 32.

For other kinds of sinks, see Bricklayer, clause No. 91; Mason, clauses Nos. 55 and 97; Plumber, clause No. 33; and Carpenter, clause No. 288.

Slate creasing and weathering.

(**22**)—See Mason, clause No. 50; and Bricklayer, clause No. 116.

TILER.

PLAIN TILES.

(Clauses Nos. 1 to 10.)

Plain tiles. (**1**)—The plain tiles to be whole, even in thickness, square, fairly straight, and free from cracks and blemishes.

Eaves and verges. Put all half tiles; and tile and half tiles at verges, and double courses at eaves.

Labours. Perform all cutting, halving and labours.

Leave water-tight. Leave tiling water-tight at completion of buildings.

Clean gutters and pipes. Clean out gutters and stack-pipes.

Pitch. The pitch to be 45° or height of roof $\frac{1}{2}$ of span. (This is the least pitch desirable.)

The pitch may be from 30° to almost any greater angle.

Roof tiling. (**2**)—Cover the main roof and outbuildings with Broseley plain tiles with cogs cast on, laid to a $3\frac{3}{4}$ in. gauge, bedded in hydraulic lime and hair mortar (or cement) none of which is to appear on the outside, and the eaves bedded in cement. The horizontal and vertical joints to range perfectly straight, and to be cut and dressed to the ridges, hips, gables, valleys and verges. Each course to be laid flat on a previous course and properly bonded in every part, and hung to $1\frac{1}{4}$ in. $\times$ 1 in. (or $1\frac{1}{2}$ in. $\times$ $\frac{3}{4}$ in.) sawn red fir horizontal laths, spiked to $2\frac{1}{2}$ in. $\times$ $\frac{3}{4}$ in. (or 1 in.) fir cross battening running from eaves to ridge, spaced 12 in. apart, spiked through the felt to the boarding beneath.

Glass tiles. Allow for (say) 20 glass tiles, in $\frac{1}{8}$ in. ribbed plate, screwed to the laths, and with holes cut through the boarding to allow the light to penetrate.

Also see Glazier, notes to clause No. 3.
An explanation of this cross battening is given in Slater under

clause No. 6. Double fir or oak laths $1\frac{1}{4}$ in. × $\frac{1}{4}$ in. may be used, and the tiles would then be fixed with tenter-hooks, as nails would split the laths.

Tiles without cogs are hung to the laths either with oak pins or $2\frac{1}{2}$ in. round galvanised iron nail pins.

In addition to being hung with cogs, the tiles may be nailed to the battens with copper or iron nails, either entirely or only at every fourth course.

Tiles may be bedded dry without mortar or bedded dry on straw. If the tiles are nailed or hung to the laths, but without boarding under, then the tiling may be rendered on the under side between the laths in hydraulic lime and hair mortar; or the tiling may be "torched" in hydraulic lime and hair mortar on the under side, that is pointing the horizontal joints up only.

The gauge may also be $3\frac{1}{2}$ in. or 4 in., but not more. Plain tiles are usually made 10 in. × 6 in. × $\frac{1}{2}$ in. and $10\frac{1}{4}$ in. × $6\frac{1}{2}$ in. × $\frac{5}{8}$ in., and either square or ornamental shaped.

State if there be any ornamental courses, the distance apart, and the number of courses wide; such as "three ornamental courses and four plain courses alternately."

Tiles may be had in different colours, as brindled, straw, brown and other shades; the brindled stand the weather best. The best tiles are made at Broseley, but there are many other local makings.

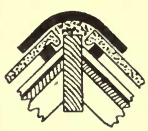
Plain tiling may be used as a roof covering to all good buildings, houses or cottages.

Tiling requires timbers one-third stronger than slating. Tiles absorb much moisture, and may be dipped in boiled oil as a preventive.

Cheeks to dormers.

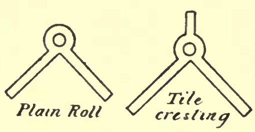
(3)—Cover cheeks of dormers with tiling, laths, battens and felt similar to the main roofs.

Hips, ridges and valleys.



(4)—The hips, ridges and valleys to be in round Broseley tiles, bedded and jointed in cement, with junction tiles to hips and ridges. The hip and valley tiles to be nailed with 3 in. nails.

Hips and ridges may be finished in plain round roll tile ridging with wings, or with ornamental ridge tile cresting, and jointed together with oak dowels and bedded in cement. Ornamental finials are used either in tile ware, lead or ironwork. Allow a p.c. sum for each finial, such as from 15s. to 25s. Valleys are often formed in lead, and sometimes in zinc. The hips and ridges may also be formed in lead, as in Plumber, clause No. 11.



Iron stays.

(5)—Put iron stay hooks to the end tiles of ridges, hips and valleys, and paint three oils.

The ridges would only require iron stay hooks in the case of a gable end where no finial was provided. The hip and valley iron stay hooks may be in ornamental ironwork, in that case allow a p.c. sum, such as 10s. each.

Mitred hips or valleys.

(**6**)—The hips and valleys to be cut and mitred together, and carefully dressed over the secret gutters, as also to all rakes of roofs against walls, chimney stacks, dormers, traps and skylights.

See remarks to clause No. 9 under Slater, referring to secret gutters and mitred valleys.

Filleting.

(**7**)—Run cement filleting as flashings to the roofs of back additions (see Bricklayer, clause No. 92).

See remarks under clause No. 10 in Slater.

Verges.

(**8**)—Bed and point verges in cement.

Felt.

(**9**)—See clause No. 8 under Slater.

Vertical tiling.

(**10**)—Cover the upper portion of walls of house in vertical plain tiling, with angle tiles at angles, bedded and pointed in hydraulic lime and hair mortar, and nailed with copper (or galvanised iron) nails to 2 in. × 1 in. fir battens plugged to brickwork.

Put double course of tiles at foot, tilted by a weather fillet over the ornamental brick (or stone) band below.

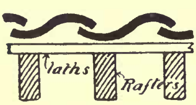
State if there are to be any ornamental courses, with the number of courses; or if the tiling be in all ornamental tiles.

The battens may be fixed to vertical timbers built in the walls every 14 in. to 18 in. apart. Instead of vertical angle tiles sometimes wood beaded fillets are used, or the tiles may be cut and mitred at the angles. Vertical tiling is not always bedded and pointed in mortar, but hung dry.

PANTILING.

(Clauses Nos. 11 to 15.)

Pantiling.



(**11**)—Cover the roof with pantiles laid to a 3 in. (4 in. or 5 in.) lap, upon $1\frac{1}{4}$ in. × 1 in. red fir laths spiked to rafters, bedded and pointed in hydraulic lime and hair mortar.

Perform all cutting and labours.

Leave tiling water-tight at completion.

Clean out gutters and stack-pipes.

Pitch. The pitch to be not less than 24°, or height of roof two-ninths of span.

Pantiles are made about 14 in. × 9 in., with small cogs, and do not require nails. Glass tiles are made in the form of pantiles. Pantiles are chiefly used in sheds, workshops and cheap cottages, but never in good work. Boarding and felt are seldom, if ever, used with pantiling. There are other similar kinds of pantiles, such as double roll tiles and corrugated tiles. Pantile laths may be $1\frac{1}{2}$ in. × 1 in.

Hips, valleys and ridges. (**12**)—To be simple special made concave and convex tiles, bedded in cement and nailed to the roof timbers.

Iron stays. (**13**)—Put iron stay hooks to end tiles of hips, ridges and valleys, and paint three oils.

Filleting. (**14**)—See clause No. 7.

Verges. (**15**)—See clause No. 2.

STONE TILER.

Stone tile roofing.

(**1**)—Cover the main roofs and outbuildings with "Tetbury" (or other locality) stone tiles, first quality, laid to a $3\frac{1}{2}$ in. lap at 39° pitch in diminished courses from eaves to ridges, with a double course at eaves, and cut and dressed to hips, valleys and verges, and properly bonded in every part, and shouldered up in lime and hair mortar. Each tile to be fixed with one oak peg on to $1\frac{1}{4}$ in. $\times \frac{1}{4}$ in. sawn oak laths spiked to rafters. The valleys to be formed with the stone tiles worked round to an easy angle. Bed and point verges in cement. Perform all cuttings and labours. Leave roofs water-tight.

Stone tiles as a roof covering are much used in the Stroud Valley, and other places where stone tiles are cheaper than slate. Instead of shouldering the stone tiles in mortar, the laths may be rendered between the rafters from the under side, and perhaps this is the better way. The ridges, hips and valleys may either be in lead (see Plumber, clause No. 11), or else in tiles (see Tiler, clause No. 4); but the stone hip and ridge tiles are more in keeping with the rest of the roof. The hips and valleys are never mitred, as with slates and tiles.

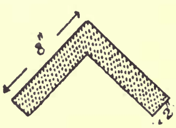
Boarding and felt are never used, but they may be as long as the laths are kept clear of the boarding for the oak pegs to rest upon, by raising the laths sufficiently above the boarding, with $2\frac{1}{2}$ in. $\times$ 1 in. battens every 12 in. apart, running from the ridges to the eaves.

The roof timbers must be strong, as stone tiles are heavy, say one-half stronger than that required for slates.

Pitch.

(**2**)—The pitch to be 39°, or height of roof two-sevenths of span. (This is a least pitch.)

Hips and ridges.



(**3**)—The hips and ridges to be formed out of solid sawn stone, 8 in. wide on each splay, in lengths of not less than 3 ft., bedded and jointed in cement, with solid cut hip and ridge junction pieces, and strong wrought-iron stays painted three oils to the lowest hip stones.

Cheeks.

(**4**)—Lay similar stone tiles and laths to cheeks of dormers.

Clean out gutters and pipes.

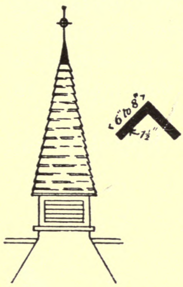
(**5**)—Clean out gutters and stack-pipes.

Glass tiles.

(**6**)—See Slater, clause No. 7.

SHINGLER.

Oak shingles.



(**1**)—Cover the turret with $\frac{1}{4}$ in. split oak shingles 6 in. wide by 12 in. (to 18) in. long, laid to a 4 in. (or 5 in.) lap at 60° pitch, with double course at eaves, and nailed with copper nails to the boarding beneath. The hips (and ridges) to be formed and cut out of solid oak in long lengths 6 in. (or 8 in.) wide on each splay, and screwed on with copper (or brass) screws (and finished with solid cut oak hip and ridge junction pieces).

Shingles may be in cedar or larch. Battens are not required. The hips may be cut to a mitre, and in fact they make the neater work, but in that case a lead secret gutter should be taken, see Plumber, clause No. 11. Shingles should not be laid to a less pitch than 45°. They are bonded together in a very similar manner to slates.

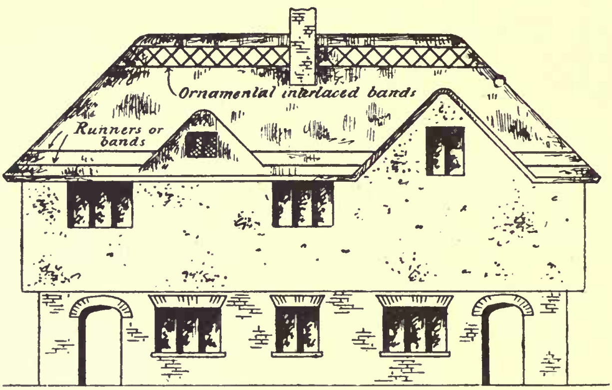
Finial.

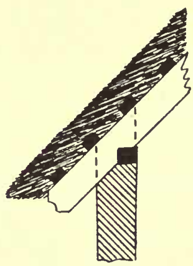
(**2**)—Describe an oak or lead apex-piece, with a finial or vane on top.

THATCHER.

Thatching. (**1**)—The roof and dormers to be covered with wheaten straw (or thin wiry rye straw) 15 in. thick, laid to a pitch of 45°, in short bundles, the straw ends only showing, and the thatching carefully formed round the hips, ridges, valleys and chimney stacks and sewed on with tarred line to $1\frac{1}{4}$ in. $\times \frac{1}{4}$ in. sawn oak laths 8 in. apart, spiked to rafters.

The eaves and gable ends to be neatly clipped off and dressed up.





The two (or one) "runners" (bands) along the eaves to be formed with twined straw spiked to the thatch covering with hazel spikes, the ends of spikes being left showing. The ornamental bands to the ridges to be formed in a similar manner, but interlaced.

Pitch. (**2**)—The pitch to be 45°, or height of roof to be one half span. (This is a least pitch.)

Thatch is laid from 12 in. to 16 in. thick, and may also be formed with reeds when they are to be obtained, or with oaten straw; and in inferior work even with heather.

Fir laths may be used; or in cheaper work rough ash or hazel "hetherings" spaced up to 12 in. apart.

The bands or "runners" are also formed with ash or hazel "hetherings," split in half and fixed with buckles (a kind of wooden hairpin).

The roof should be ceiled underneath with plaster.

Thatch is used chiefly in small cottages, lodges, barns and farm buildings, but is found in some of the better class of old houses. Being a non-conductor, it is specially suitable for dairies. Chimney stacks should be kept well above the roofs. Wheat and hay stacks are covered with thatch in an inferior and temporary manner.

PLUMBER.

Sheet lead. (1)—The sheet lead to be milled, uniform in thickness and texture, and free from sand cracks or other defects.

Tests. In order to test the weight of the sheet lead used, the architect shall be at liberty to cut out portions from any part of the leadwork after having been laid; the contractor shall make allowance in his estimate for such tests, and shall replace such damaged work with entirely new sheets.

Leave water-tight. Leave plumbing to roofs, flats, pipes and fittings water-tight.

Cast lead for roofing purposes is made in sheets some 16 to 18 ft. long, by 6 ft. wide, but it is seldom now used, milled lead having taken its place. If cast lead be used, the least thickness should weigh some 6 lb. per super. ft.

Milled lead is rolled in sheets some 25 to 35 ft. long, by 6 ft. to $7\frac{1}{2}$ ft. wide, averaging in weight from 1 lb. to 12 lbs. per super. ft.

The following are the weights of milled sheet lead as used in the various positions:—

4 lb. per super. ft. in weight is suitable for safes, seatings to stone and iron columns, ends of girders, and secret gutters to roofs.

5 lb. per super. ft. in weight is suitable for flashings, aprons, seatings to iron columns and ends of girders, lead slates, soakers, tacks, tingles, and secret gutters to roofs.

6 lb. per super. ft. in weight is suitable for hips, ridges, valleys, flats, cisterns, lead hip slates, soakers, tacks, tingles, lead slates, flashings and aprons.

7 lb. per super. ft. in weight is suitable for gutters, sinks, flats, hips, ridges, valleys, lead hips, slates, and cesspools to gutters.

8 lb. per super. ft. in weight is suitable for sinks, cesspools to gutters, and gutters.

In crediting old lead removed from roofs, 6 lb. per cwt. is allowed off the net weight as "tare," that is the loss on dross.

Soft or peaty water stored in lead cisterns or lead pipes attacks the lead and causes the water to be poisoned. Hard waters stored in lead cisterns or lead pipe are practically not affected.

Sizes of lead slates and fastenings. (2)—Tacks, tingles, lead slates and soakers to be out of 6 lb. (or 5 lb.) sheet lead.

Dressings.

(3)—The dressings to be out of sheet lead of the following widths and weights, lapped together at joints, and with all tacks and tingles.

Flashings 5 in. (6 in. or 7 in.) wide, out of 5 (or 6) lb. leads. When soaker slates are not provided, the stepped flashings to be 12 in. (15 or 16 in.) wide, out of 5 (or 6) lb. lead.

When soaker slates are provided, the stepped flashings to be 7 in. (or 8 in.) wide, out of 5 (or 6) lb. lead.

Ridges and hips to be 18 in. wide, out of 6 lb. lead.

Valleys, 20 in. wide, out of 6 lb. lead.

Soakers, 12 in. wide, out of 6 lb. lead.

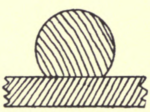
Aprons, 15 in. (or 16 in.) wide, out of 5 (or 6) lb. lead.

Lead hip slates, 20 in. wide, out of 6 (or 7) lb. lead.

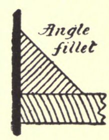
The width of aprons is governed by the depth of the timbers they have to lap.

Rolls and angle tilting fillets to flats.

(4)—The lead covering the rolls to be bossed out at ends and intersections, and spaced at not more than 2 ft. 6 in. centres, and open copper nailed on the one side of the sheets.



The woodwork for lead rolls to be out of 2 in. × 2 in. ($2\frac{1}{2}$ in. × 2 in., $2\frac{1}{2}$ in. × $2\frac{1}{2}$ in., 3 in. × $2\frac{1}{2}$ in., or 3 in. × 3 in.) rounded deal.



Angle tilting fillets to be out of 2 in. × 2 in. (or $1\frac{1}{2}$ in. × $1\frac{1}{2}$ in.)

The wood rolls and angle fillets are also described under Carpenter, clauses Nos. 119 and 117 respectively; Zinc Worker, clauses Nos. 1, 2, and 4; and Coppersmith, clause No. 1.

The usual size of wood rolls to flats for leadwork is 2 in. × 2 in.

Hips and ridge rolls.

For woodwork to rolls, see Carpenter, clause No. 83.

Solder.

(5)—No solder to be used in flats or roofing, except where lead pipes cut through the leadwork.

Copper nailing.

(6)—Close copper nailing to be spaced 1 in. apart.

Open copper nailing to be spaced 3 in. (or 4 in.) apart.

Flats.

(Clauses Nos. 7 to 10, 1 to 6 and 17 to 19.)

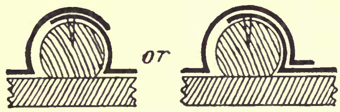
For sketches of flats, see Carpenter, clauses Nos. 113, 123a and 124.

Flats.

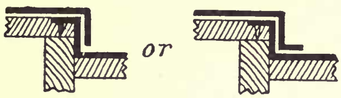
(**7**)—Cover the flats over kitchen and billiard room (or other parts) with 6 lb. sheet lead, laid to falls of 2 in. ($1\frac{1}{2}$ in., $2\frac{1}{2}$ in., or 3 in.), in 8 ft. (or 10 ft.) with 2 in. (or $1\frac{1}{2}$ in.) drips, properly dressed over rolls, drips, and tilting fillets, with bossed ends to rolls and intersections. The sheets to be turned up 6 in. against walls, kerbs, and other work, and with 5 lb. lead flashings 6 in. wide over, properly passed and tacked, and with 5 lb. lead aprons 12 in. wide over kerbs of skylights (or trap doors), passed and tacked and open copper nailed to tops of curbs. The rolls and drips to be open copper nailed on the one side of the sheets.

The least pitch for lead roofing is 4°.

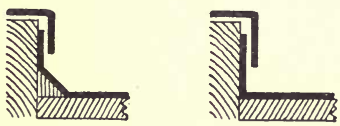
The leadwork over rolls is laid either as



Drips are laid either as



The angle tilting fillet between horizontal and vertical faces prevents the lead being so much bruised when being dressed over as when turned up vertically.



Box gutters to flats.

(**8**)—The gutters to be not less than 9 in. (or 12 in.) wide, and laid to falls of 3 in. ($2\frac{1}{2}$ in., 2 in., or $1\frac{1}{2}$ in.) in 10 ft. in 7 lb. lead, with 2 in. (or $1\frac{1}{2}$ in.) drips every 10 ft. apart; the sheets to be turned up 6 in. against walls, and open copper nailed on the one side to the flats, and dressed over the tilting fillets. Put 5 lb. lead flashings, 6 in. wide, passed and tacked.

For sketch of box gutters, see Carpenter, clauses Nos. 113 and 79.

The least fall to gutters should be not less than 4°.

The tilting fillets in the gutters enables their cleaner sweeping, in addition to the reason given in the notes under the preceding clause, No. 7. A fair width for a box gutter is 12 in., but they may be made 15 in. and 18 in. wide.

Cesspools to gutters.

(**9**)—The cesspools to be bossed out of 7 lb. (or 8 lb.) lead, and made not less than 9 in. × 9 in. × 6 in. in the clear, and close copper nailed on the upper edges. Connect to the cesspools short lengths of 4 in. diameter, 8 lb. to the foot lead pipe, and carry through walls, and discharge over rain-water heads.

or,

Instead of lead pipes boss the cesspools out with an apron shoot, discharging through the walls over the rain-water heads.

For sketch of cesspool, see Carpenter, clause No. 78. If the gutter be wider than 9 in. the cesspool would be correspondingly large.

Roses to outlets. **(10)**—Put over the cesspool outlets strong hemispherical copper (or galvanised iron) wire (or perforated lead) roses with thick wire lugs.

Sometimes a strong copper or galvanised iron wire grating is placed over the entire area of the cesspool.

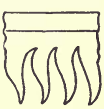
Dressings to Slated or Tiled Roofs.

(Clauses Nos. 11 to 13, 1 to 6, and 16 to 19.)

For sketch plan of roof see Carpenter, clause No. 75; and for sketches of hips, ridges, and valleys, see Carpenter, clauses Nos. 83 and 81.

Hips, ridges and valleys to tiled or slated roofs. **(11)**—Form the hips and ridges 18 in. wide, and valleys 20 in. wide, in 6 lb. sheet lead, properly lapped, passed, and secured with lead clips and copper nails; the hips and ridges to be bossed out at intersections, and the valleys worked over tilting fillets. Put 6 lb. lead soaker slates 12 in. wide to all rakes of roof where abutting against walls, chimney stacks, dormers, traps or skylights, with 5 lb. lead stepped flashings 7 in. wide over. The horizontal flashings to be 6 in. wide, out of 5 lb. lead, passed and tacked.

State if ridges be cut to ornamental shapes, and in that case they may be out of any width of lead according to the design. State if the lead be dressed over deal finials.



In slated or tiled roofs having mitred hips and valleys, a secret gutter must be specified, as no leadwork shows at the intersections of the roof planes, the description would run:—

Secret gutters. Form secret gutters under the mitred hips and valleys, out of 5 lb. (or 4 lb.) lead 8 in. wide, and open copper nailed on both edges. The secret gutters to the rakes of roof against chimney stacks, dormers, skylights, and traps, to be laid in a similar manner, but out of lead 12 in. wide, with 5 lb. lead stepped flashings 7 in. wide over.

For sketches of secret gutters, see Carpenter, clause No. 80.

Secret gutters along the rakes of roofs do not require lead soaker slates.

Soaker slates may be put under mitred-hips and valleys instead of secret gutters.

Slated roofs, with roughly mitred hips, may be formed without secret gutters, provided that the hips be covered with lead hip slates, cut to match the courses of the slates, and secured with copper nails. This form of hip looks very effective, especially if the slates somewhat match the colour of the leadwork. Valleys are seldom formed with secret gutters.

Gutters to tiled or slated roofs.

(**12**)—The gutters to be in no part less than 6 in. wide, and laid to falls of 3 in. ($1\frac{1}{2}$ in., 2 in., or $2\frac{1}{2}$ in.) in 10 ft. in 7 lb. lead, with 2 in. (or $1\frac{1}{2}$ in.) drips every 10 ft. apart, and turned up 9 in. (or 12 in.) under the slating, and 6 in. against the walls with 5 lb. lead flashings over, 6 in. wide, passed and tacked and all dressed over the tilting fillets. Put similar gutters and plain and stepped flashings to chimney stacks, skylights, dormers and traps.

For sketch plans of roof and wall gutters, see Carpenter, clauses Nos. 75 and 77.

The least fall to lead gutters should not be less than 4°.

Cesspools. See clause No. 9.

Roses. See clause No. 10.

Lead-covered dormers.

(**13**)—Cover the flat on top of dormers with 6 lb. lead, lapped over at ends and bossed and dressed over 2 in. × 2 in. deal rounded rolls; with 5 lb. lead cheeks, secured with brass screws and soldered dots, and with neatly welted ends on the front edges, close copper nailed. Put 5 lb. lead soaker slates 12 in. wide to rakes with roof, and 5 lb. lead aprons dressed over kerbs and open copper nailed.

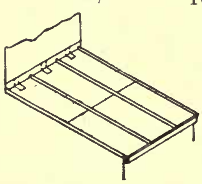
For sketch of dormer, see Carpenter, clause No. 94.

Slated (or tiled) dormers.

Put to the slated (or tiled) dormers a 6 lb. lead soaker where the ridge meets the roof plane.

The ridges, valley, hips, flashings, soaker slates, and aprons to this latter class of dormer would be the same as to an ordinary slated (or tiled) roof; see clause No. 11.

Lean-to roofs (clauses Nos. 14, 1 to 6, and 17 to 19).



(**14**)—Cover the "lean-to" roof with 6 lb. sheet lead turned up 6 in. against wall, and properly bossed over rolls, and open copper nailed on the one edge, and dressed over the tilting fillets, eaves and verges. Solder to the leadwork of each bay formed by the rolls a 9 in. × 6 in. 6 lb. lead tack, wedged in at the wall end. Put 5 lb. lead flashing 6 in. wide, passed and tacked.

The horizontal jointings of the sheets to be formed with a welted joint secured with clips copper nailed to the boarding.

For sketches of welted joints, see Zincworker, notes to clause No. 2, or Coppersmith, clause No. 1.

When lead is laid to a sharp pitch it is liable to "creep" down.

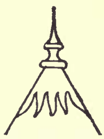
If a hipped double span roof be entirely covered in lead, the description would be similar to the above clause, with the addition of the ordinary ridging and hips out of lead about 18 in. wide, bossed out over the rolls.

Drips are not required either to a lean-to or double span roof if the pitch be steep, say from about 20° upwards.

Lead-covered roofs and domes (clauses Nos. 15, 1 to 6, 16, 18 and 19).

(15)—Cover dome with 6 lb. sheet lead, dressed over rolls, and open copper nailed on the one side, and with welted joints to the horizontal joints of sheets. Dress the finial over in 7 lb. lead. Form the gutter at base of dome in 7 lb. lead.

Finials and vanes.



(16)—Boss the lead out solid over bases of finials and vanes with 6 lb. lead cut to ornamental shape.

Rake, wedge and point.

(17)—Rake out joints of brickwork, wedge with lead (deal or oak) wedging, and point in cement to flashings.

Also see Bricklayer, clause No. 24.

Lead rain-water pipes.

(18)—The rain-water pipes to be drawn out of 7 (6, 8, or 10) lb. per super. ft. lead, $3\frac{1}{2}$ in. diameter, with astragal joints, loose bands, ears and rose-headed nails. Provide with ornamental cast lead rain-water heads, p.c. (say) £2. 10s. each.

Lead rain-water pipes are made $3\frac{1}{2}$ in., 4 in., $4\frac{1}{2}$ in., 5 in., $5\frac{1}{2}$ in. and 6 in. diameters in drawn lead, or they may be made square of any size of the same weights of sheet lead, seamed up at the joints, or else in lengths of cast lead of similar sizes.

Clean gutters and pipes.

(19)—Clean out all gutters and stack-pipes.

Seatings to cast-iron columns and girders.

(20)—Put 5 lb. (or 4 lb.) lead seatings under the iron columns, and under ends of steel or iron joists and girders where bedded in walls.

Seatings to stone columns.

Put 4 lb. lead seatings to the joints of stone and granite columns, kept $\frac{1}{2}$ in. back from the face all round.

Cold and Hot Water Supply and Sanitary Work.

(Clauses Nos. 21 to 65.)

When this branch of plumbing work relates to an old building, clause No. 29 under Drainage may be inserted here.

An allowance of from 16 to 20 gallons of water per head per day should be allowed in non-manufacturing towns, and 20 to 30 gallons per head per day in manufacturing towns.

A horse requires 16 gallons of water per day.

For a two-wheeled carriage 9 gallons per day is required.

For a four-wheeled carriage 16 gallons per day is required.

A cow requires 12 gallons per day.

The average rainfall in various places is from 20 in. to 70 in. per annum, or a mean may be taken at from 31 in. to 42 in. per annum, see notes to clause No. 53 under Drainage; and the average available rainfall for storage may be taken at about three-fifths of the rainfall.

Sea water weighs 64·11 lbs. per cubic ft.

Distilled water weighs 62·425 lbs. per cubic ft.

Water may be taken as weighing approximately 10 lbs. per gallon.

There are $6\frac{1}{4}$ gallons approximately to a cubic ft. of water.

A pipe 4 in. diameter, 3 ft. long, holds 1·6 gallons of water.

Galvanised iron cisterns are usually made in three qualities:—

The ordinary strong quality.
$\frac{1}{8}$ in. plate bare.
$\frac{1}{8}$ in. plate full.

And of the following net capacities and sizes:—

No. of gallons.	Length in feet.	Width in feet.	Depth in feet.
20	2·0	1·4	1·3
25	2·0	1·5	1·5
30	2·0	1·6	1·7
40	2·3	1·8	1·8
50	2·5	1·10	1·10
60	2·6	1·11	1·11
70	2·8	2·2	2·0
80	2·10	2·3	2·0
90	3·0	2·3	2·2
100	3·2	2·3	2·3
125	3·4	2·7	2·4
150	3·6	2·7	2·8
200	3·10	2·11	2·11
250	4·2	3·3	3·0
300	4·6	3·7	3·0
500	6·0	4·0	3·4
1000	8·0	5·0	4·0

Other sizes may be had to order. They may also be had in $\frac{3}{16}$ in. plate full.

In theory a pump will draw water up a suction pipe for a depth of 34 ft. In practice 25 ft. is considered the greatest working depth, but 15 ft. as a working depth gives very satisfactory results. When water has to be drawn up from a greater depth, special gearing has to be used. Also see notes to clause No. 57. The reason that water can only be drawn up from a depth of 34 ft. is that the pressure of the atmosphere balances a column of water of that depth. Roughly speaking, the pressure of a column of water is $\frac{1}{2}$ lb. (actually a little under) per foot in height per square inch. The pressure of the atmosphere is about 15 lbs. per square inch.

Liquids may be syphoned out from a higher tank into a lower tank by placing one end of the syphon (merely a bent tube) into the liquid of the higher tank, and either exhausting the air out of the syphon or else filling the syphon with water, when the pressure of the atmosphere on the liquid in the higher tank will force it up through the syphon into the lower tank. The pressure of the atmosphere will be sufficient to force water through a syphon, provided that the height of the rise of the syphon above the water be not greater than 33 ft.

Water supply.

(21)—The water supply to be in accordance with the Water Company's printed regulations, and executed to the satisfaction of their inspector. Give notice to the Company and pay their fees.

Soldered joints.

(22)—Soldered joints to be wiped.

Lead pipes.

(23)—Lead pipes to be drawn, the sizes mentioned being their internal bore. All lead service pipes where not buried in the ground, to be bound round with dry hair felt and canvas, and kept on the face of the work, and 2 ft. away from hot-water pipes.

See Carpenter, clause No. 41, for casing to pipes.

Dry hair felt is used for packing round cisterns, encasing pipes, and against partitions.

For thicknesses and weight of dry hair felt, see Carpenter, notes to clause No. 137.

Dry hair felt is apt to harbour vermin.

Service pipes. Service pipes to be known as "strong."

Pipes	½ in.	bore to weigh	about	6 lbs.	per yard run.
„	¾ in.	„	„	9 lbs.	„
„	1 in.	„	„	12 lbs.	„
„	1¼ in.	„	„	16 lbs.	„
„	1½ in.	„	„	18 lbs.	„
„	2 in.	„	„	24 lbs.	„

When lead pipes are not protected with felt and canvas, then specify "all lead pipes exposed to view to be painted four times in oil colour, and decorated to match the other work"; see Painter, clause No. 49.

The weight of service pipes is governed either by the weight or "head" of water from the cistern above, or by the pressures on the various Water Companies' mains. The weights given are suitable up to "heads" of 300 ft. Service pipes may be in iron, either "black" or "galvanised," and would be described similar as under clause No. 63.

When iron pipes are used, it is a good plan to join them together with union sockets, in order that any separate length may be easily removed. When iron pipes are used to convey rain water, the jointing should be made with whiting mixed with boiled oil and varnish, instead of the usual red lead cement.

Waste and overflow pipes. All waste and overflow pipes to be known as "middle."

Pipes	¾ in.	bore to weigh	about	5 lbs.	per yard run.
„	1 in.	„	„	7 lbs.	„
„	1¼ in.	„	„	9 lbs.	„
„	1½ in.	„	„	10 lbs.	„
„	2 in.	„	„	12 lbs.	„

Ventilating pipes. All ventilating pipes to be known as "light."

Pipes	1 in.	bore to weigh	about	4 lbs.	per yard run.
„	1¼ in.	„	„	6 lbs.	„
„	1½ in.	„	„	7 lbs.	„
„	2 in.	„	„	9 lbs.	„

Pipes in ground. Pipes bedded in the ground to be encased in 1 in. tarred rough deal troughs filled with liquid pitch (or asphalt).

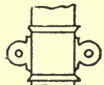
Also see Carpenter, clause No. 40.

Lead encased block tin pipes are lead pipes with an inner casing of block tin, so as to do away with the liability of lead poisoning. They are much stronger than ordinary lead pipes and are made in the same sizes.

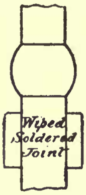
Tacks and wall hooks for pipes.

Pipes $1\frac{1}{2}$ in. bore and over to have lead tacks out of 6 lb. sheet lead, soldered on for fixing. Pipes under $1\frac{1}{2}$ in. bore to be fastened with wrought-iron wall hooks.

Soil pipes generally.



Astragal Band Joint



Lead soil pipes to be drawn out of 8 (or 10) lb. per foot lead, $3\frac{1}{2}$ in. (or 4 in.) diameter, with astragal band joints, ears and rose-headed nails (or wiped soldered joints with 6 lb. lead tacks and rose-headed nails). No knees or square junctions to be used, but all bends and Y-branches to be worked to easy sweeps.

Put at the foot of all lead soil pipes a 3 in. (or 4 in.) brass screw cap and socket for inspection, and brass foot piece for support.

All vertical soil pipes to be tested by first soldering a piece of lead over the top of the closet traps before the apparatus is fixed, and then filling the whole height of soil pipe with a column of water.

Lead soil pipes are made in 6 lb., 7 lb., 8 lb. and 10 lb. per sup. foot lead, in $3\frac{1}{2}$ in., 4 in., $4\frac{1}{2}$ in., 5 in., $5\frac{1}{2}$ in. and 6 in. diameters. Astragal band jointed pipes make the neatest work, but are more expensive than wiped soldered joints. Seamed lead pipes should never be allowed.

Wall hooks.

(**24**)—Wall hooks 5 in. long to weigh 7 to the lb.
" 6 " " 5 "
" 7 " " 4 "

Traps.

(**25**)—Traps to be of "strong" cast lead, those with screw caps must have them burned in.

Brasswork.

(**26**)—Plumbers' brasswork to be of the best quality, well finished.

Cocks.

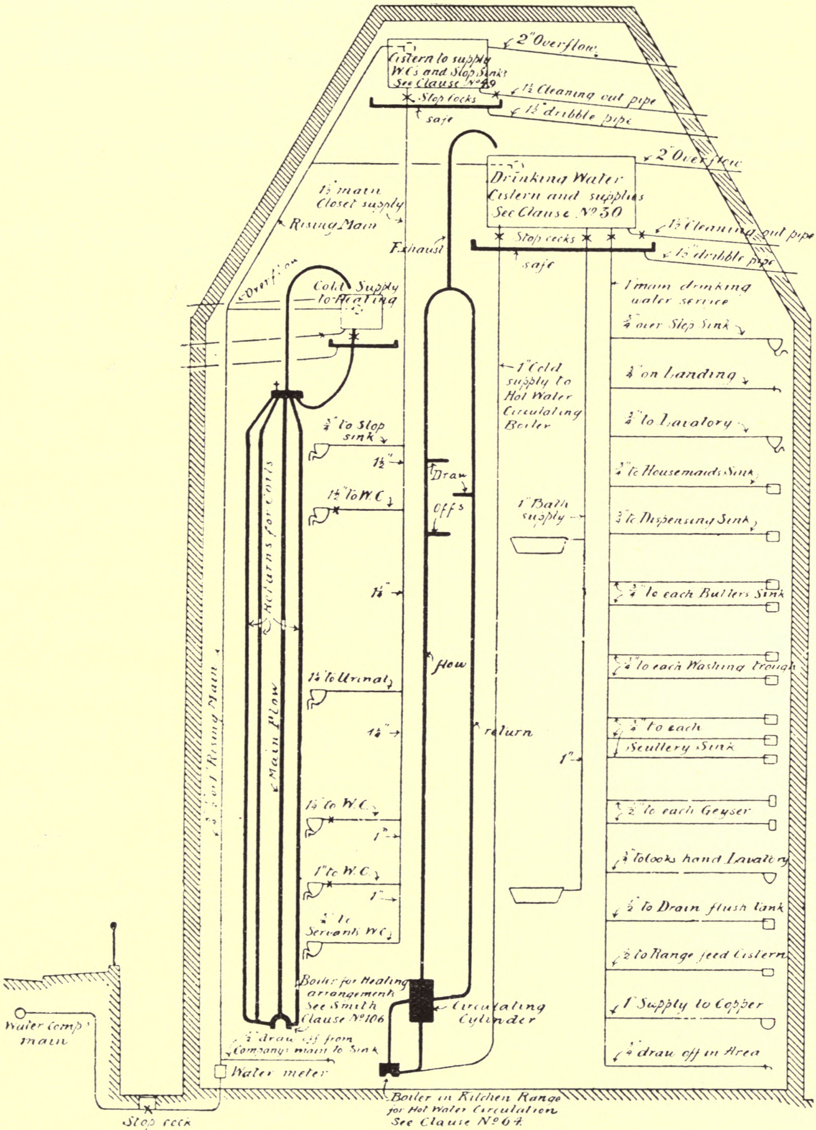
Bib-cocks and draw taps to be best screw-down kind, with stuffing box and loose leather-faced valves.

All labour and materials.

(**27**)—Provide all soldered joints, stopped ends, bends, lead-headed nails, wall hooks, soldered dots, lead slates, tacks and tingles.

Rising main.

(**28**)—Dig up ground in road and pavement, and connect to Company's main with $\frac{3}{4}$ in. ($\frac{1}{2}$ in. or 1 in.) screw ferrule and union, carry on $\frac{3}{4}$ in. (or other size) lead pipe to building as rising main, and encase where in ground in an 1 in. tarred rough deal gutter trough laid 2 ft. 6 in. deep and filled with pitch, fill in the ground and leave the road and pavement in good condition, and cart away the surplus earth. Carry the $\frac{3}{4}$ in. (or other size) rising main up to the three (one or more) cisterns in roof, and terminate to each with a $\frac{3}{4}$ in. (or other size) patent high-pressure equilibrium ball valve with copper ball and stem, p.c. 10s. each, and bracket support under. Put in convenient



position in lobby a ¾ in. (or other size) gun-metal stop-cock with spanner, and fix over an enamelled iron label with "Rising Main Stop-Cock" printed on.

The Water Companies regulate the size of the tapping of their mains for the rising main to the cisterns; in many cases tapping for ½ in. pipe only being allowed.

The stop-cock on the rising main is often put outside the house, in that case the description would be:—

Put $\frac{3}{4}$ in. (or other size) square-headed, screw-down stop-cock, with stuffing box and loose leather-faced valve, protected by a cast-iron cover and guard box let into the ground in concrete.

Draw-off from main.

Take $\frac{1}{2}$ in. lead pipe draw-off direct from rising main, and finish over scullery sink with bib-cock, p.c. 8s.

This draw-off will allow water to be drawn from the Company's mains should the drinking-water cistern be under repair.

Water meter.

(**29**)—Provide and fix on a shelf in suitable position a patent water meter, p.c. (say) £9, with an enamelled iron tablet over labelled "Water Meter."

Water meters are generally used when the consumption of water is very great, such as in public baths and laundries. A water meter to a $\frac{1}{2}$ in. pipe is worth about £7; to an $1\frac{1}{2}$ in. pipe about £18.

A water meter for a $\frac{3}{8}$ in. bore pipe is capable of measuring 500 gals. per hour.

A water meter for a $\frac{1}{2}$ in. bore pipe is capable of measuring 750 gals. per hour.

A water meter for a $\frac{3}{4}$ in. bore pipe is capable of measuring 1200 gals. per hour.

A water meter for a 1 in. bore pipe is capable of measuring 2200 gals. per hour.

A water meter for a $1\frac{1}{2}$ in. bore pipe is capable of measuring 4000 gals. per hour.

For storage cistern and supplies to w.c.'s, slop sinks and urinals, see clauses Nos. 49 to 52 and 54 to 56.

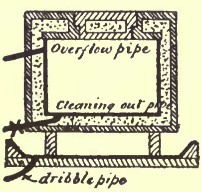
Drinking water, and any position from which water may be liable to be drawn off and used either for drinking or washing purposes, should be drawn from a cistern entirely separate from that supplying the w.c.'s.

Drinking-Water Cistern and Supplies to the various Fittings.

(Clauses Nos. 30 to 46 and 48.)

See sketch under clause No. 28.

Drinking-water cistern.

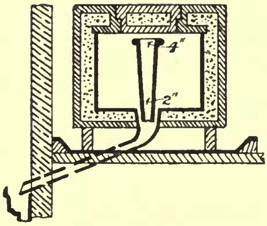


(**30**)—Fix in roof in position shown, on 11 in. × 3 in. rough fir bearers, a 300 (more or less) gallon $\frac{1}{8}$ in. plate full (or bare) close riveted galvanised wrought-iron cistern, with strong angle stays. Cover cistern over on the outside with thick brown paper glued on, and encase with 1 in. wrought, matched and beaded boarding, with a 2 in. space between, and fill in with silicate cotton (or hair felt). Form a double-cased rebated man-hole lid in top, hinged on 4 in. butts (or 18 in. cross garnets hinges). The top of cistern to have two thicknesses of boarding to form the casing for the silicate cotton.

Overflow.

Tap cistern 3 in. down and connect with brass union, and take 2 in. lead overflow pipe through roof, soldered to a 6 lb. lead slate, and terminate with a copper (or brass) flap.

Or the overflow may be thus:—



Tap cistern and connect with brass union, and take 2 in. to 4 in. trumpet-mouth overflow with brass plug, and carry down 2 in. pipe and discharge over a hopper head outside wall, terminated with a copper (or brass) flap.

It is very customary now to do away with large storage cisterns in private houses, and in fact in some cases cisterns are done away with altogether, and the draw-offs taken direct from the rising main, owing to the Water Company keeping on a constant supply. But in case the Water Company cuts off the water for repairs, it might make matters very inconvenient if there be no storage supply available.

Overflow pipes should never discharge over sinks or like positions, owing to the danger of bad gas finding its way up the pipes.

Brown paper protects a cistern from the effect of cold.

Silicate cotton as a padding to cisterns will be found more durable than hair felt, hair felt being liable to harbour vermin.

Safe.

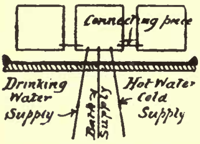
Form a tray (safe) under cistern in 4 lb. lead, 3 in. wider all round than cistern casing, and open copper nailed to a 3 in. × 2 in. splayed angle fillet on an 1 in. rough boarded bottom. Solder in to tray an $1\frac{1}{2}$ in. dribble pipe carried through roof and soldered to a 6 lb. lead slate, and finished with a brass (or copper) flap.

Cleaning-out pipe.

Tap cistern and connect with brass union, and take an $1\frac{1}{2}$ in. lead cleaning-out pipe kept as flush with bottom of cistern as possible, and carry through roof and solder to a 6 lb. lead slate, and terminate with a brass (or copper) flap. Put to this pipe a full-way $1\frac{1}{2}$ in. stop-cock close under or near cistern, with an enamelled iron tablet labelled "Stop-cock to cleaning-out pipe."

A trumpet-mouth overflow pipe to a cistern also serves as a cleaning-out pipe, the trumpet-mouth pipe, being movable, simply requires pulling up for the cistern to empty, but the rush of water may be very great if it be pulled out entirely at once.

In cases where there is insufficient height or space to get in a large cistern, two or more smaller cisterns may be substituted. The description for the cisterns, the supply, wastes, safe and casing, would remain exactly similar as the preceding paragraphs, the only additional item required would be the connecting pipes between the tanks, which would be described as :—



Connect the three cisterns in roof together with 1 in. ($1\frac{1}{4}$ in. or $1\frac{1}{2}$ in.) galvanised iron pipe, nuts and washers, kept up $1\frac{1}{2}$ in. from the bottom of cisterns.

The size of these connecting pipes is regulated by the combined sizes of the main supply pipes drawing off these cisterns.

For lead-lined cisterns see clause No. 61.

Main service pipe and branches.

Tap cistern and connect with 1 in. brass union and washer, kept $1\frac{1}{2}$ in. above bottom, and carry down 1 in. lead service pipe to lowest draw-off. Put an 1 in. screw-down brass (or gun-metal) stop-cock fixed just below or near cistern, with an enamelled iron tablet labelled "Stop-Cock to Main Supply."

This pipe is kept up in the cistern to prevent sediment being drawn down from the bottom of the cistern.

Branch off from this 1 in. main :—

$\frac{3}{4}$ in.	separate lead	supply	over slop sink.
$\frac{3}{4}$ in.	,,	,,	to lavatory.
1 in.	,,	,,	to copper.
$\frac{3}{4}$ in.	,,	,,	to housemaid's sink.
$\frac{3}{4}$ in.	,,	,,	to each butler's sink.
$\frac{3}{4}$ in.	,,	,,	to each scullery sink.
$\frac{3}{4}$ in.	,,	,,	to dispensary sink.
$\frac{3}{4}$ in.	,,	,,	to each washing trough.
$\frac{3}{4}$ in.	,,	,,	to draw-off on area.
$\frac{3}{4}$ in.	,,	,,	to draw-off on landing.
$\frac{3}{4}$ in.	,,	,,	to cook's hand lavatory

in kitchen, and terminate each of these positions with $\frac{3}{4}$ in. gun-metal screw-down bib-cock, p.c. 10s. each, and 1 in. similar cock to copper supply.

A cook's hand lavatory in a kitchen is useful in a large establishment.

Flushing tank supply.

Branch off $\frac{1}{2}$ in. lead pipe to supply flushing tank to drains with stop-cock (see Drainage, clause No. 47).

Feed cistern to range. Branch off $\frac{1}{2}$ in. lead supply for feed cistern to range, and connect to range with 1 in. supply, and put a cast-iron galvanised feed cistern $10\frac{1}{2}$ in. × 1 ft. 3 in. × $7\frac{1}{2}$ in. wide, with cover, brackets and ball valve.

Feed cisterns are also made 10 in. × 12 in. × 6 in. and $10\frac{1}{4}$ in. × $13\frac{1}{2}$ in. × $6\frac{1}{2}$ in., either plain or galvanised.

A feed cistern to a range is only required when the boiler has an open top. A feed cistern to a hot-water circulating tank, as shown by the sketch and mentioned in the notes under clause No. 64, would be similar to this paragraph, except that the supply should be 1 in.

Geyser supply. Branch off a $\frac{1}{2}$ in. lead supply to each geyser, with stop-cock.

Supply to kitchen range circulating boiler. Tap cistern and connect with 1 in. brass union and washer, and take a separate 1 in. galvanised iron supply pipe down to kitchen to feed the circulating boiler; put an 1 in. stop-cock just under (or near) cistern, labelled "Stop-Cock to Kitchen Boiler Supply."

For circulating cistern and supplies to hot-water arrangements, see clauses Nos. 63 and 64.

Care must be taken that this cock is not shut off, otherwise the boiler would not be supplied with water and would be liable to burn through. This pipe is required for supplying cold water to the hot-water circulation throughout the house to the baths, lavatories and sinks. It may be a $\frac{3}{4}$ in. pipe if there be not much work to do.

Bath supply. Tap cistern and connect with 1 in. brass union and washer, and take a separate 1 in. lead supply to bath with an 1 in. stop-cock placed just under (or near) cistern, and labelled "Stop-Cock to Bath Supply," and furnish with an 1 in. gun-metal screw-down bib-cock, p.c. 15s.

If patent fittings to the bath be required, then this bib-cock would be omitted. It is often the practice to put a p.c. amount for the bath and cocks.

A separate supply direct from a cistern to a bath is only required when there are many other draw-offs or several baths, and in a small house it is seldom put.

In some houses a cistern is provided in the basement to supply the sinks and other draw-offs in the basement, then in this case the description would run as clause No. 31, and the foregoing paragraphs under clause No. 30 should be modified accordingly, so as to supply only positions above the basement level. But the pipe supplying the circulating boiler in kitchen must in any case be taken off the higher cistern, otherwise the hot water would not rise to the level of the upper floors

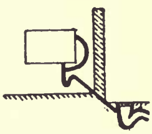
Separate cistern to supply basement only.

(**31**)—Branch off from the rising main a $\frac{3}{4}$ in. lead pipe to a cistern in the basement (it might be placed, if more convenient, on the ground floor), and terminate with $\frac{3}{4}$ in. patent high-pressure equilibrium ball valve, with copper ball and stem p.c. 10s., and fix on a bracket support.

A low-pressure ball-cock may be used when a Water Company supply a district only at a low pressure from their mains.

Then describe the following items under clause No. 30, such as the cistern itself, with its overflow, and say where it is to discharge; the cleaning-out pipe, with stop-cock, and say where it is to discharge; and the casing, the packing and bearers to cistern. The tray and its waste will not be required if the cistern be over an area. Then take the main supply with the stop-cock and the various branches to the sinks, and any other positions below the basement cistern level. The supply to the feed tank of an open boiler in the range may also be taken off this lower cistern.

Housemaid's and butler's pantry sinks.



(**32**)—The housemaid's and butler's pantry sinks are each to be lined with 8 lb. lead bottom and 7 lb. sides, with all the angles soldered, and the top edges of leadwork copper nailed; take $1\frac{1}{2}$ in. lead waste pipe, with $2\frac{1}{2}$ in. diameter sunk brass cobweb movable grating, brass plug, washer, and double-link brass chain, with $1\frac{1}{2}$ in. lead **S** (or **P**) trap and screw cap, and carry through wall to discharge over hopper head (or gully) outside.

Put $1\frac{1}{2}$ in. overflow connected above trap, with 3 in. brass perforated grating soldered in.

The top of sink should be about 3 ft. from floor. The carpenter's work to the sinks may be described here with the plumbing; see Carpenter, clauses Nos. 286 and 287. Tinned copper is very suitable for sinks, as it is not so liable to expansion and contraction as lead.

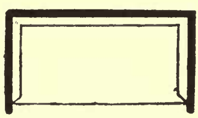
Draining boards.

The draining boards and skirtings round sinks to be dressed over with 8 lb. lead, close copper nailed on all edges.

The carpenter's work to the draining boards may be described here with the plumbing; see Carpenter, clauses Nos. 286 and 287.

Safes.

Lay under each sink on the floor level a 6 lb. lead safe, dressed round on three sides over deal splayed fillets, and close copper nailed on four edges.



The safes under these sinks are more for cleanliness than for catching any overflow water, and they are made in 6 lb. lead owing to the wear and tear on them from articles being placed under the sinks.

Scullery sinks. **(33)**—The three sinks and draining boards in scullery to be lined precisely similar to the housemaid's sink (see clause No. 32), but with separate 2 in. lead wastes, traps, screw caps, plugs, chains and washers, and $1\frac{1}{2}$ in. separate overflows; the wastes being carried to a gully outside the wall.

For sketch see Carpenter, clause No. 288.

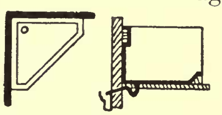
Tinned copper may also be used in these sinks.

The carpenter's work may be described here with the plumbing; see Carpenter, clause No. 288. It is only in large establishments that these sinks are required in a scullery, one being for washing the vegetables, another for rinsing, and the third for washing the plates and dishes. They must not be made too deep or fixed too low.

In small private houses a glazed stoneware sink is mostly used, about 3 ft. 6 in. × 1 ft. 6 in. × 6 in. deep, the supplies and wastes being the same as to lead-lined sinks.

For other kinds of sinks, see Bricklayer, clauses Nos. 32 and 91; Mason, clauses Nos. 55 and 97; and Slater, clause No. 21. Safes are never put under scullery sinks, as the flooring is usually of stone or some similar material.

Draw-off sink on landing. **(34)**—Line sink with 8 lb. lead bottom, turned up against walls 18 in., and over small angle fillets on floor, and close copper nailed all round.



Take $1\frac{1}{4}$ in. waste pipe, with trap, and 3 in. brass grating soldered in, and carry outside wall over copper head.

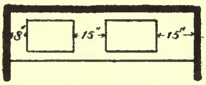
See Carpenter, clause No. 290.

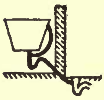
This sink being merely under a draw-off, a trap is not absolutely necessary; but a brass flap should then be taken instead, to minimise any draught.

Dispenser's sink. **(35)**—The sink, draining board and skirting to be lined with best pewter $\frac{1}{16}$ in. thick, copper nailed on edges and soldered at angles, with $1\frac{1}{4}$ in. waste and overflow, trap, screw cap, 2 in. brass grating, plug, washer and chain. Line the two shelves and skirting at back with similar pewter, close copper nailed.

Take a lead safe to it if required, as in clause No. 32. The carpenter's work may be described here with the plumbing; see Carpenter, clause No. 289.

Washing troughs in laundry.

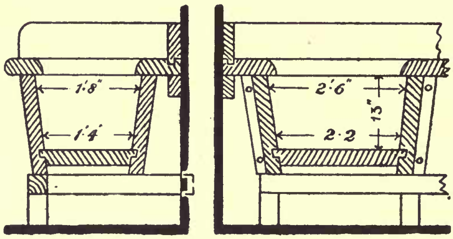




(**35a**)—Put two glazed stoneware washing troughs in laundry, each 3 ft. × 2 ft. × 1 ft. 3 in. deep, p.c. 25s. each, supported on brick bearers. Take a 2 in. lead waste pipe, 2 in. lead **S** (or **P**) trap, screw cap, with $2\frac{1}{2}$ in. diameter brass screw grating, plug, washer and chain from each trough to gully outside, with 2 in. overflow connected to trough side of trap, and $2\frac{1}{2}$ in. diameter brass grating. For wood top, see Carpenter, clause No. 291.

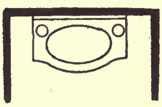
The waste pipes will keep more free if the traps be dispensed with.

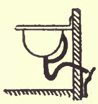
Stoneware troughs are also made 2 ft. 3 in. × 2 ft. × 15 in., 2 ft. 3 in. × 1 ft. 8 in. × 15 in., 2 ft. × 1 ft. 8 in. × 15 in. deep.



The troughs may be obtained in galvanised iron; or else be made with $1\frac{1}{2}$ in. (or $1\frac{1}{4}$ in.) wrought pine sides, and 2 in. (or $1\frac{1}{2}$ in.) bottom, grooved and rebated together, and bolted with $\frac{1}{2}$ in. bolts, nuts and washers, similar to a wood bath; see clause No. 40.

Lavatory.





(**36**)—The lavatory basin to be in white china ware 14 in. diameter, p.c. £1 (or 16 in. × 14 in. elliptical shape) secured with brass clips to an 1 in. polished Sicilian marble top, shaped and moulded on outer edges, with hole cut for basin with a thumb-moulded rim, and rebated on the under side, and with two small elliptical sinkings 6 in. × 3 in. × $\frac{5}{8}$ in. deep, dished out for soap and nail brushes. Put a 6 in. × $\frac{3}{4}$ in. polished Sicilian marble skirting along wall side, screwed to wall with brass screws countersunk, and rebated to lavatory top, and fix the whole on cast-iron ornamental brackets. Connect to basin an $1\frac{1}{2}$ in. brass union and fly nut, with $1\frac{1}{2}$ in. lead **S** (or **P**) trap, screw cap, and $1\frac{1}{2}$ in. lead waste carried through wall over a hopper head, and supply with a $1\frac{1}{2}$ in. diameter brass movable cobweb grating and plug, and double link brass chain. Connect $1\frac{1}{2}$ in. overflow pipe with 2 in. diameter brass grating to the overflow arm of basin to lavatory side of trap. Allow the p.c. sum of 10s. each for two cocks.

If it be an angle lavatory there will be two sides of skirting.

Lavatories are made with the basin, top and skirting all in one piece in porcelain, when a p.c. amount may be allowed for them; the supplies and wastes being described. They are also made to fix without brackets.

The cocks and fittings may be in nickel.

Tip-up lavatories are unsanitary. For slate lavatory tops see Slater, clause No. 20. Enamelled cast-iron lavatories are liable to chip.

For casings to lavatories see Carpenter, clause No. 281, but a lavatory is more sanitary without a casing.

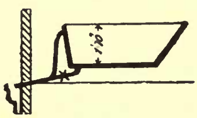
The cocks, waste and overflow fittings may be of some patent kind.

Safe. A safe is not often put under a lavatory, in case one is required the description may be as clause No. 51.

Cook's hand lavatory. Similar to the foregoing clause, No. 36, modified, but without marble top.

Lavatories are made in 10 in., 12 in., 13 in., 14 in. and 16 in. diameters, and 13 in. × 15 in. and 14 in. × 18 in. elliptical shapes; the 10 in. and 12 in. diameter basins are very small for adults. Height of lavatory from floor 2 ft. 5 in.

Bath. (**37**)—Put in bath-room a best white heavily glazed fire-clay (porcelain) bath, 5 ft. 6 in. long, with circular end, p.c. £10, and fix on wrought deal bearers. Carry 2 in. lead waste to hopper head outside wall, with brass union and enamelled porcelain grid. Form an **S** (or **P**) trap in the waste pipe, and put a 2 in. full-way brass stop valve. Take 2 in. overflow into waste pipe on the bath side of trap, with a 3 in. enamelled porcelain grid. Allow the p.c. sum of £3 for lever handles, engraved with "Hot," "Cold" and "Waste." (For bath casing, see Carpenter, clause No. 278.)



The grids to the wastes and overflows may also be in brass or nickel. The trap should be made sufficiently easy to admit of sweeping with a brush; no screw cap would then be necessary. The cheapest way of supplying a bath with water is by simply discharging the water over the top with ordinary screw-down bib-cocks; and for emptying the bath with an ordinary plug and chain instead of the stop valve.

Fire-clay baths are made 5 ft., 5 ft. 6 in. and 6 ft. long, either tapered or parallel. The 5 ft. 6 in. is a very useful size for men and 5 ft. for women and schools. Fire-clay baths, when thoroughly warmed, retain the heat longer than any other kind of bath material, but they require more water to get them thoroughly hot in the first instance. They should always be used in public institutions. Excellent patent stop valves for bath wastes are now made.

Safe. Block up floor to a fall of $1\frac{1}{2}$ in. in 4 ft., and lay 1 in. rough boarding with angle fillets round, and small gutter formed on front edge, dress over with 4 lb. lead safe, open copper nailed, and take an $1\frac{1}{2}$ in. dribble pipe over hopper head outside wall with brass (or copper) flap.

For sketch see Carpenter, clause No. 278.

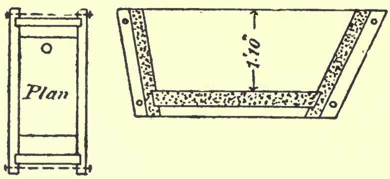
For bath casing and step, see Carpenter, clause No. 278.

If the safe be formed in this way a step will most likely be required to the bath, owing to the bath being blocked up.

Frequently the lead safe is merely laid level on the flooring with a dribble pipe, but in case of an overflow this form of safe does not clean itself, owing to its having no fall. If this class of safe be required, the description would run:—

Lay 4 lb. lead safe on floor against angle fillets, and open copper nailed all round, carry $1\frac{1}{2}$ in. dribble pipe through wall over hopper head with brass (or copper) flap.

Slate bath.



(38)—Form the bath 5 ft. 6 in. long, 1 ft. 10 in. wide, 1 ft. 10 in. deep, with 1 in. (or $\frac{3}{4}$ in.) tapered rubbed Bangor slate slab sides and ends and $1\frac{1}{4}$ in. bottom, and rebated together in lead cement, and bolted with four $\frac{3}{4}$ in. galvanised iron bolts, nuts, heads and washers.

Then describe the waste, overflow, valve, trap, gratings, blocking up and safe, similar to clause No. 37. For wood casing see Carpenter, clause No. 278.

Marble bath.

(39)—The description is similar to a slate bath (clause No. 38), except that the marble would be described as polished. State the kind of marble, 1 in. Sicilian marble is often used.

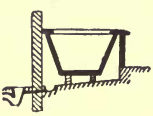
Then describe the waste, overflow, valve, trap, gratings, blocking up and safe, similar to clause No. 37. For wood casing see Carpenter, clause No. 278.

Wood bath.

(40)—The description would be similar to a slate bath (clause No. 38), but the material would be $1\frac{1}{4}$ in. wrought pine sides and ends and $1\frac{1}{2}$ in. bottom.

Then describe the overflow, waste, valve, trap, gratings, blocking up and safe, similar to clause No. 37. For wood casing see Carpenter, clause No. 278.

A sunk bath on the ground floor.



(41)—Put in bath-room a best white glazed fire-clay bath, 5 ft. 6 in. long, with circular end, p.c. £10. The bath to be sunk 10 in. down below the floor level. Carry 2 in. lead waste pipe and union with $3\frac{1}{2}$ in. diameter brass cobweb movable grating (or porcelain), and discharge into gully outside wall with brass flap on end, form **S** (or **P**) trap in waste, and put a 2 in. full-way stop valve, take 2 in. overflow into waste the bath side of trap, with $3\frac{1}{2}$ in. diameter enamelled fire-clay grid. Block up the bath on fir bearers, and form safe round in concrete and cement to falls, and take $1\frac{1}{2}$ in. dribble pipe with $2\frac{1}{2}$ in. brass grating and brass (or copper) flap into gully outside wall. (See Carpenter, clause No. 278, for wood casing.)

The grating to the dribble pipe is put in as an extra precaution against insects and creeping things finding their way into the bath safe from the ground outside.

A copper bath. (**42**)—The bath to be a taper flanged brim copper bath 5 ft. 6 in. long, enamelled inside, with circular end and dished bottom, with short lengths of copper pipes for hot and cold supplies, overflow and waste, and $3\frac{1}{2}$ in. diameter copper gratings. The bath complete is not to weigh less than 100 lbs. Put 2 in. full-way screw-down valve, 2 in. lead **S** (or **P**) trap formed in the waste, and carry 2 in. lead pipe outside wall to discharge over a hopper head. Take 2 in. lead overflow pipe with $3\frac{1}{2}$ in. diameter copper grating, and connect to waste the bath side of trap.

Allow the p.c. sum of £3 for lever fittings, engraved "Hot," "Cold" and "Waste."

Then describe the blocking up of floor and the lead safe as in clause No. 37. Sheet metal baths require cradling to support the sides when the bath is full of water, see Carpenter, clause No. 278. The cradling may be described here with the bath. Copper baths are made 5 ft., 5 ft. 6 in. and 6 ft. long. They require less water to keep them warm than any other form of bath. For wood casing see Carpenter, clause No. 278.

An iron bath. (**43**)—The bath to be a taper flanged brim cast-iron bath 5 ft. 6 in. long, enamelled inside best finish, with circular end and dished bottom. Put 2 in. full-way screw-down valve, with 2 in. lead **S** (or **P**) trap formed in the waste, and $3\frac{1}{2}$ in. diameter screw grating and brass union, and carry 2 in. lead waste outside wall to discharge over a hopper head. Take 2 in. lead overflow with brass union and $3\frac{1}{2}$ in. diameter grating, and connect to waste the bath side of trap. Allow the p.c. sum of £3 for lever fittings, engraved "Hot," "Cold" and "Waste."

Then describe the blocking up of floor, the safe and cradling, see clauses Nos. 42 and 37, and casing, see Carpenter, clause No. 278. A p.c. amount is often allowed for the bath and fittings, instead of describing it in detail. Cast-iron baths are made 5 ft., 5 ft. 6 in. and 6 ft. long, and in three qualities, "japanned white or sienna," as a third quality; and "enamelled," in "second" and "first" qualities. If no wood casing is required, cast-iron baths can be obtained in the same qualities and sizes, but state there is to be a rolled brim on edge (instead of a flanged brim) and cast-iron feet, and that the bath is painted on the outside. All the fittings would remain as to other baths.

For a plain wood rim, see Carpenter, clause No. 279.

Steel bath. (44)—Describe in exactly a similar way as to a copper bath, see clauses Nos. 42 and 37, but state that it is to be a steel bath, and either enamelled or polished. (For wood casing, see clause No. 278 under Carpenter.)

Steel baths are made in the same sizes as copper; they heat better than cast iron and nearly as well as copper.

Zinc bath. (45)—Describe in exactly similar a way as to a copper bath, see clauses Nos. 42 and 37, but state it is to be in extra strong zinc, with small lengths of copper pipe for hot and cold supplies, waste and overflow, and that it is japanned inside.

Zinc baths are made 5 ft., 5 ft. 3 in. and 5 ft. 6 in. long, in two qualities, "ordinary" and "extra strong." They are only used in inferior work. For casing, see Carpenter, clause No. 278.

Movable bath. (46)—To be a copper taper bath 5 ft. 6 in. long, with circular ends, enamelled inside, rounded edges (or brim) and dished bottom, the whole to weigh not less than 90 lbs., and to be supplied with a $\frac{3}{4}$ in. copper waste pipe connection, with $\frac{3}{4}$ in. screw-down gun-metal bib-cock, and the bath encased in a strong wrought-iron frame, fitted on wheels, and supplied with handles at either end and painted on the outside.

These baths are used for bringing into the room of an invalid, and may be in cast-iron or steel. A p.c. amount may be allowed instead of describing them.

There are other kinds of baths, such as the "Roman Bath," and the "Needle Bath," each fitted with spray, shower, douche, wave and plunge. Allow a p.c. amount, such as £15, but describe the waste and supplies.

Rejapan old bath. (47)—Take down bath and fittings, scrape off old japan, clean and rejapan white and refix. This work is to be sent to and done by a proper bath japanner.

Geyser. (48)—Allow the p.c. sum of £6 for a patent geyser to bath, with copper interior, lay on gas and cold-water supplies to same and put a bracket stand for fixing, and take a gas exhaust flue out into the open.

For supplies see clause No. 30; and Gasfitter, clause No. 8.

There are various makers of geysers. The prices range according to the quickness and amount of water required to be heated. Geysers are serviceable for obtaining a quick hot supply. Geysers are usually made to supply from 6 quarts to 1, $1\frac{1}{2}$, 2, 3, 4 and $4\frac{1}{2}$ gallons of hot water at 100° Fahr. per minute, according to their size.

Cisterns and Supplies to W.C.'s, Slop Sink and Urinals.

(Clauses Nos. 49 to 52, and 54 to 56.)

See sketch under clause No. 28.

Cistern and supplies to W.C.'s. (**49**)—Fix in roof on 11 in. × 3 in. rough fir bearers in position shown, a 300-gallon $\frac{1}{8}$ in. plate full (or bare), close riveted, galvanised wrought-iron cistern, with strong angle stays. Line cistern on the outside with thick brown paper glued on, and encase with 1 in. wrought, matched and beaded boards with a 2 in. space between filled in with silicate cotton (or hair felt), and form a double cased rebated manhole lid in top, hinged with 4 in. wrought butts (or 18 in. cross garnett hinges). There is to be a double casing to the top of the cistern to take the packing.

For lead-lined cisterns, see clause No. 61.

Overflow. Tap cistern 3 in. down, and connect with brass union, and take 2 in. lead overflow through roof, soldered to a 6 lb. lead slate, and terminate with copper (or brass) flap.

or the overflow may be thus,

Tap cistern and connect with brass union, and take 2 in. trumpet-mouth overflow with brass plug, and carry down 2 in. pipe and discharge over a hopper head outside wall, and terminate with a copper (or brass) flap.

The remarks under clause No. 30, referring to a trumpet-mouth overflow, equally apply here.

Safe. Form a tray (or safe) under cistern in 4 lb. lead, 3 in. wider all round than cistern, and open copper nailed to a 3 in. × 2 in. splayed angle fillet on a 1 in. rough boarded bottom. Solder in to tray an $1\frac{1}{2}$ in. lead dribble pipe, carried outside roof and soldered to a 6 lb. lead slate, and finish with brass (or copper) flap.

Cleaning-out pipe. Tap cistern and connect with brass union, and take 11 in. lead cleaning-out pipe, kept as flush with bottom of cistern as possible, and carry through roof soldered to a 6 lb. lead slate, and terminate with brass (or copper) flap. Put to this pipe a full-way 1½ in. stop-cock close under (or near) cistern.

For sketch, see clause No. 30.

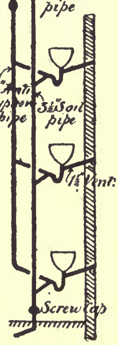
Main supplies to closets.

(**50**)—Tap cistern and connect with 1½ in. brass union kept 1½ in. above bottom of cistern, and carry down 1½ in. lead supply, with a 1½ in. stop-cock just under (or near) cistern and labelled "Stop-Cock to W.C.'s," and continue the 1½ in. pipe down to valve closet on top floor, continued on with 1¼ in. pipe to valve closet on first floor, and continued on with 1 in. pipe to valve closet on ground floor, and put a separate stop-cock to each closet supply immediately next the closet valve.

Branch off with separate ¾ in. lead pipes to each water-waste preventer to slop sink, urinal, and servants' closet in basement.

This 1½ in. pipe is kept up above the bottom of the cistern to prevent the sediment being drawn down into the closet valves. The nearer a valve closet is fixed to a cistern, the larger will the supply pipe be required, as a valve closet depends for the flush entirely upon the "head" or pressure of the water. In a wash-down or pedestal closet, with a water-waste preventer, the question of the supply pipe is quite a different matter, see clause No. 52.

Valve closets and soil pipe.



(**51**)—The valve closets on the second, first and ground floors to have best white ware basins, copper bellows regulators, and 1½ in., 1¼ in. and 1 in. supply unions respectively, p.c. £5. 10s. each, and with a stop-cock to each for shutting off the supply (previously mentioned in clause No. 50). Take 1½ in. vent pipe from each valve box, and carry through wall and finish with brass perforated grating. Connect 3½ in. anti-D lead syphon traps to a 3½ in. lead pipe arm, branched into a 3½ in. diameter drawn lead soil pipe out of 8 lb. (or 10 lb.) per foot, with astragal banded joints, ears and rose-headed nails every 6 ft. apart (or wiped soldered joints, with 6 lb. lead tacks and nails every 6 ft. apart), and carry down to drain and connect to a brass seating at foot, and provide with a 3 in. brass screw cap for cleaning purposes. Carry the soil pipe up in lead the full bore and weight, and finish 4 ft. above parapet with pierced and expanded lead head and copper wire rose with lugs.

A 7 lb. or 8 lb. lead ventilating pipe will be sufficient.

Anti-syphon pipe. Branch from a point near top of trap of each closet, a $2\frac{1}{2}$ in. anti-syphon lead arm, and connect into a 3 in. anti-syphon lead pipe carried up from ground-floor trap to 3 ft. above parapet, and jointed with astragal bands as before (or wiped soldered joints and tacks), and finished with expanded, pierced lead head and copper wire rose and lugs.

The old-fashioned pan closet with container is both insanitary and out of date. D traps should never be used, as they never clean out entirely. An S or P trap cleanses well, but owing to the force of water down a closet, it is apt to unsyphon, an anti-D trap is then preferable. It is a trap having the advantages of D, P and S traps, without their disadvantages.

The stop-cock immediately between the supply pipe and the closet apparatus is useful for shutting the water off when repairing the closet.

There are many makers of valve closets.

Closet seats should not be fixed higher than 15 in. or 16 in. for adults, and for children they may be as low as 9 in. or 12 in. from the floor. To obtain these low heights, the apparatus must sometimes either be partially sunk below the floor level or else a step be provided.

Safes. Block up the floor to a fall of $1\frac{1}{2}$ in. in 4 ft., and lay 1 in. rough boarding with angle fillets round, and small gutter formed on front edge, dress over with 4 lb. lead safe, open copper nailed, and take $1\frac{1}{2}$ in. dribble pipe with brass (or copper) flap through wall.

See notes under clause No. 37, referring to safes, which would apply here.

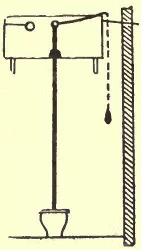
For woodwork to closets see Carpenter, clauses Nos. 282 and 283.

Servants' wash-down or pedestal closet. (52)—The w.c. in basement to be a "glazed white-ware pedestal closet," with flushing rim and trap, and white wood seat, p.c. £2, and provided with a 3-gallon flush automatic syphon water-waste preventer and cover, fixed on iron brackets, with galvanised iron (or brass) chain or handle, and cased in with deal movable casing and felt packing; carry an 1 in. (or $\frac{3}{4}$ in.) overflow arm through wall, and finish with brass (or copper) flap. Take down $1\frac{1}{2}$ in. (or $1\frac{1}{4}$ in.) lead discharge pipe, with bands and nails, to closet pan, with rubber cone bound round the connection in copper wire.

There are several very excellent wash-down closets. This class of closet has no riser, merely a seat and flap, which are generally sold with the closet, either in white wood or mahogany. See Carpenter, clause No. 284. A p.c. amount may be allowed for the water-waste preventer, as there are many makes to choose from.

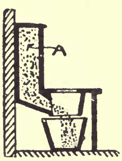
Water-waste preventers are supplied with a ball valve in them; they should be fixed about 7 ft. above the closet for $1\frac{1}{4}$ in. pipe flush, 6 ft. for an $1\frac{1}{2}$ in. pipe, and 5 ft. will do with a 2 in. pipe. The London Water Companies will only allow a 2-gallon flush water-waste preventer.

As this class of closet is limited in its flush to the capacity of the water-waste preventer, this is somewhat of an objection. A very good plan is to form a cistern in deal, lined with lead, and holding about 6 to 10 gallons, and provided with an overflow pipe, and fed by a $\frac{3}{4}$ in. pipe and ball-cock, and then by taking the $1\frac{1}{4}$ in., $1\frac{1}{2}$ in., or 2 in. supply pipe immediately from the bottom of the cistern to the closet, with a lift and drop valve at the outgo. By pulling the chain then some 6 to 10 gallons can be discharged at once if required. In a valve closet, so long as the handle is held up, so long will the supply of water continue to flow.



The old-fashioned long hopper closets are out of date, they do not cleanse themselves; the wash-down or pedestal closets having taken their place. Pedestal closets are made with plain and ornamental fronts.

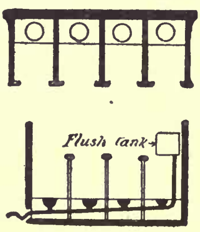
Earth closets.



(53)—In positions where there is no drain an earth closet may be used. Allow a p.c. amount, such as £7 complete. Of course no water supply is required. The container A is filled with finely sifted dry earth or dry cinder siftings, and after using the closet, a valve is loosed, which allows a certain amount (usually $1\frac{1}{2}$ pints) to fall through the closet basin on to the soil below, which should be cleared away, once every day at least.

Dry earth of a loamy character is the best deodorant and disinfectant of fæcal matter. Sand is of little use. The siftings should pass through a sieve having 4 meshes to the inch. The earth may be dried during the summer under cover, or else in front of a fireplace or over a drying stove.

Latrines or trough closets.



(54)—Latrines or trough closets are used mostly in barracks, charity and Board schools, and consist of a range of two or more closet pans, all discharging along the troughs into a trap at one end. They are objectionable as they are not cleanly. They are made either in painted or galvanised cast iron, or else in stoneware; the whole range being flushed out at one time by an automatic cistern.

For casing, see Carpenter, clause No. 285.

Slop sink.

(55)—The slop sink to be formed with a wash-down pedestal closet pan and slop tray top, p.c. £2, with lead P trap and thick cast brass wire grating at outgo. Branch with a 3 in. lead arm pipe into a 3 in. vertical galvanised heavy cast-iron soil pipe, carried from drain to 3 ft. above parapet, fixed with loose bands and rose-headed nails, and jointed with lead filings, and finished with a lead pierced and expanded hood and copper wire rose and lugs.

For sketch, see Carpenter, clause No. 292.

Flush pipe to slop sink. Put a 3-gallon flush automatic syphon water-waste preventer and cover, fixed on iron brackets, with galvanised iron (or brass) chain and handle, and cased in with deal movable casing and felt packing, carry an 1 in. (or $\frac{3}{4}$ in.) overflow arm through wall, and finish with brass (or copper) flap. Take down $1\frac{1}{2}$ in. (or $1\frac{1}{4}$ in.) lead discharge pipe, with bands and nails, to slop sink pan, with rubber cone bound round the connection in copper wire.

Dress round the slop-top opening to the walls in 7 lb. lead, bossed over angle fillets and up the walls 12 in., and copper nailed.

For woodwork, see Carpenter, clause No. 292.
See notes under clause No. 52 referring to water-waste preventers.

Safe. Describe similar to clause No. 32.

Draw-off. See clause No. 30; and notes under clause No. 29.

It is better that a slop sink pipe be in iron, as the hot water thrown down is liable to damage a lead pipe. There are various kinds of slop sinks made, ornamental and otherwise, but the method specified is simple and works well. The flush tank may be of the kind specified as the alternative method mentioned in the notes under clause No. 52. Valve closets are supplied with a white ware "slop top," and require the seat to be lifted to get at. There should always be a draw-off over the slop sink for cleansing purposes, which should be drawn from the drinking water cistern, see notes under clause No. 29.

An inside urinal. (**56**)—The urinal to be a white flushing rim basin, p.c. £1, secured to wall (or slate back). Put $1\frac{1}{4}$ in. lead **S** trap, screw cap and waste, and connected to the lead soil pipe. Fit up a 2-gallon flush water-waste preventer, with cover, fixed on iron brackets, with galvanised iron (or brass) chain and handle, and cased in with deal movable casing and felt packing. Carry an 1 in. (or $\frac{3}{4}$ in.) overflow outside wall and finish with brass (or copper) flap. Take $1\frac{1}{4}$ in. lead discharge pipe, with bands and nails, to urinal basin, secured with rubber cone and bound round the connection in copper wire.

For sketch, see Slater, clause No. 17.

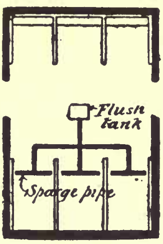
Urinals in a private house are always objectionable, unless they are kept very clean. The walls and floors round a urinal should be lined either in enamelled brick, tiles, or enamelled slate, which may be included in this description; see clause No. 17 under Slater.

The urinal waste may be taken into a $2\frac{1}{2}$ in. trap in the floor, with movable brass grating, and from thence into the soil pipe or drain direct. In a range of urinals the distance of the divisions should not be less than 18 in. apart, 24 in. being preferable. The floor should fall sharply to the back about 3 in., with a small channel to the trap.

Iron urinals are not so sanitary.

Urinal wastes must not discharge into the open, as the pipes get very foul, unless the outlet is entirely away from any window or door.

In a range of urinals without basins in the divisions, the sides and floor, gutter and trap in floor may be as clause No. 17 in Slater, in addition to the preceding clause referring to a range of urinals. They are flushed by an automatic flush tank; and instead of the pipes being connected to the basins (there being none) they are connected to a 1 in. (or $\frac{3}{4}$ in.) copper (brass, zinc or galvanised iron) sparge pipe carried along the back and sides with $\frac{1}{8}$ in. perforations every $\frac{3}{4}$ in. apart.



See Zincworker, clause No. 8; and Coppersmith, clause No. 4.

A sparge pipe is one having small holes pierced in it.

When a urinal is formed between brick divisions, the sides may be rendered over $\frac{3}{4}$ in. thick in cement and sand, 4 ft. high, and finished in $\frac{3}{8}$ in. neat cement.

Hand pump.

(57)—Allow the p.c. sum of £5 for a $2\frac{1}{2}$ in. brass lift and force hand pump to well, mounted on an oak plank, and screwed for and including $1\frac{1}{2}$ in. ($1\frac{1}{4}$ in. or 2 in.) lead (or galvanised wrought-iron) suction pipe and $1\frac{1}{4}$ in. (or 1 in.) galvanised wrought-iron delivery pipe to first floor, with $1\frac{1}{4}$ in. (or 1 in.) holding-up valve, $1\frac{1}{2}$ in. ($1\frac{1}{4}$ in. or 2 in.) suction rose, retaining valve and brass unions.

This class of pump is suitable for ordinary houses.

A gully and drain should be provided to catch the waste water.

Hand pumps are made 2 in., $2\frac{1}{2}$ in., 3 in., $3\frac{1}{2}$ in. and 4 in. diameters.

There are many kinds of pumps, either for man, horse or steam power. It is better to allow a provisional amount and select the article from a good tradesman.

A hand pump may either be simply a lift pump, or a lift and force pump combined. A lift pump merely draws water up through the suction pipe, but a lift and force pump both draws the water up and forces it to a higher level.

A pump with a long horizontal suction pipe should have a retaining valve, as it keeps the pump always charged. Suction pipes should be perfectly air-tight, as straight as possible, and with very easy bends when absolutely necessary; and it is better to put a retaining valve, even if the suction pipe be short. A suction pipe should be larger than the delivery pipe; and if the suction pipe be long, it should be of large area. The length of a suction pipe will not very materially affect the easy working of a pump, so long as it be either horizontal or fall to the pump; of course if it rise to the pump, then the amount of the rise must be taken into account as being part of the working depth from which a pump is able to draw; see notes on Pumps preceding clause No. 21. The strainer at the foot of a suction pipe should be three times the area of the suction pipe. The strainer is sometimes put near the pump valve.

The delivery pipe, that is, the pipe which is used to force the water up to a desired level, should be as straight as possible, and if practicable free from bends, which, if absolutely necessary, must be easy. A check valve should be put to the delivery pipe to relieve the pump when starting to work.

Also see notes on Pumps preceding clause No. 21.

Hydraulic ram.

(58)—In districts where there is no public Water Company, or in the case of a building situated above the level to which a public Water Company's mains will supply, then water has either to be pumped up, or else it may be obtained by a hydraulic ram. It is better to allow a provisional amount, which would be governed by the amount of water to be raised per hour and the distance of the supply.

The principle upon which a hydraulic ram works is that a volume of water with a certain fall will force a smaller volume of water to a higher level than the larger volume. Roughly speaking, about one-seventh of the water necessary to work the ram can be raised five times as high as the fall of the water being used, or one-fourteenth part may be raised ten times the height. In practice the fall desirable to work a ram may be from 18 in. to 10 ft.

Speaking tubes.

(59)—Take a $\frac{3}{4}$ in. diameter composition pipe speaking tube, fixed with clips, from kitchen to dining-room servery, and finish ends with short lengths of flexible india-rubber worsted braided tubing and nozzles, with turned walnut (or ivory) mouthpiece, whistle, brass chain, rack and small ivory indicator at either end.

Also see Painter, clause No. 48.

State any other positions required, such as from house to stables. Speaking tubes may be made with copper, zinc or iron piping, from $\frac{5}{8}$ in., $\frac{3}{4}$ in., $\frac{7}{8}$ in. and 1 in. diameter, and if the distance be very great a larger diameter pipe is necessary, such as $1\frac{1}{4}$ in. or $1\frac{1}{2}$ in.

The flexible end may be covered with silk or mohair.

The indicators are necessary when there are several tubes placed side by side, but speaking to different parts of the building.

Telephones.

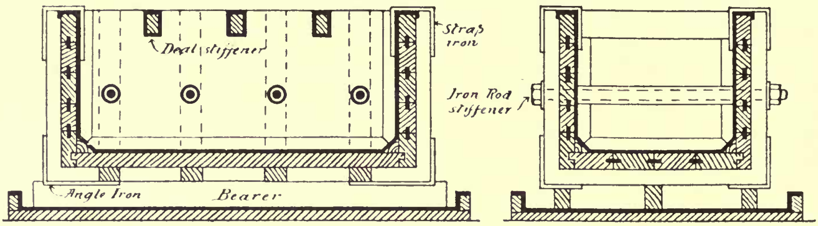
(**60**)—Allow a provisional sum.

For long distances a telephone is more suitable than a speaking tube. The advantage of a telephone is that one can speak and listen at the same time.

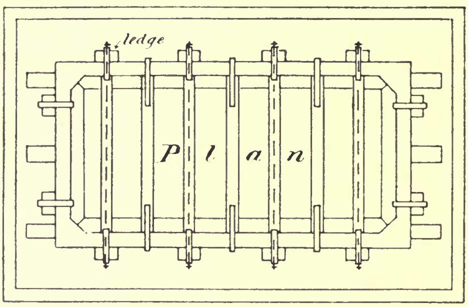
Lead-lined cisterns.

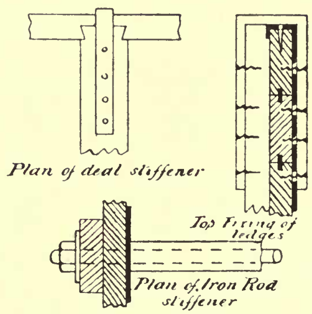
(**61**)—Galvanised iron cisterns have almost entirely superseded lead-lined cisterns. In certain positions it is impossible to get an iron cistern of sufficient capacity into an old building without disturbing the structure. A lead-lined cistern becomes then absolutely necessary, which can be built up and lined in the position desired.

The description of a large lead-lined cistern would run thus:—



Sections through Cistern





Form cistern 16 ft. long, 6 ft. wide, 5 ft. deep, with:—

$1\frac{3}{4}$ in. (2 in. or $1\frac{1}{2}$ in.) deal, wrought one side, grooved and tongued boarding to sides and ends in 7 in. widths, dovetailed at angles.

2 in. similar framing to bottom, with a fall of 2 in. to one end, and rebated to groove in side and end framings.

7 in. $\times$ $1\frac{1}{2}$ in. (or 2 in.) wrought deal ledges dovetailed together, and screwed to framing with 3 in. screws at 7 in. centres, and secured at angles with 15 in. $\times$ 15 in. $\times$ 2 in. wrought angle irons, $\frac{1}{4}$ in. metal, with ten countersunk $3\frac{1}{2}$ in. screws in each, and secured at top with ⊓-shaped wrought-iron straps 15 in. long, 2 in. $\times$ $\frac{1}{4}$ in. metal, and four 3 in. countersunk screws on each side. Care to be taken that the screws clear the joints in the framing.

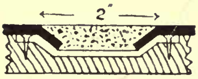
Three 6 in. $\times$ $2\frac{1}{2}$ in. wrought deal stiffeners across top of cistern, dovetailed into sides, and secured with

15 in. × 15 in. × 2 in. wrought angle iron, $\frac{1}{4}$ in. metal, screwed with four $2\frac{1}{2}$ in. countersunk screws on top and four 2 in. screws at sides.

Fill in the internal angles to sides and bottom with 2 in. × 2 in. deal angle fillets.

Four $\frac{3}{4}$ in. wrought-iron pipes (or rod) stiffeners taken through centre of tank, with heads, nuts and 4 in. × 4 in. × $\frac{1}{4}$ in. plate washers, and enclosed in strong lead pipe outer tubing let into the woodwork at both ends $\frac{3}{8}$ in., soldered on to the lead lining.

Line tank on inside with 6 lb. (or 7 lb.) milled lead sides and bottom, dressed over top edges, and $1\frac{1}{4}$ in. copper nailed 3 in. centres.



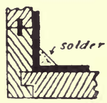
Groove out the boarding for the jointing of the lead sheets, and form the joints with 7 lb. underlay, 1 in. copper nailed 6 in. apart on either side, wiped in with solder.

Dress round in 7 lb. lead the wood stiffeners at top with soldered joints.

Paint the iron straps and stiffeners three times in oil colour before fixing.

Then describe the bearers to cistern, the casing, hair felt or silicate packing, manhole, overflow, safe, cleaning-out pipe, supply pipe and other fittings as clause No. 30.

If the cistern is to store rain water, the inside may be limewhited, cement washed or tarred. The overflow to this size tank should be 3 in. diameter, and the dribble pipe from safe $3\frac{1}{2}$ in. to 4 in. diameter. The safe being very large may either be formed like a flat with rolls, gutter and cesspool; or the lead sheets may be soldered together in the same way as to the cistern. Cistern rooms should be ventilated. Instead of wood fillets, the inside angles of cisterns may be formed in solder.



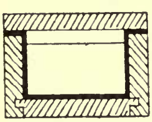
A small lead-lined cistern may be described as:—

Put in roof a 350-gallon lead-lined cistern, formed with $1\frac{1}{2}$ in. (or $1\frac{3}{4}$ in.) wrought one side, grooved and tongued deal boarding, dovetailed at angles, with bottom grooved, rebated and glued together.

Then describe the lead lining as in this clause, No. 61, and the bearers, packing, casing, manhole, overflow, safe, cleaning-out pipe, supply pipe and other fittings as clause No. 30.

For galvanised iron cisterns, see clauses Nos. 30 and 49.
For zinc-lined cisterns, see Zincworker, clause No. 7.

Water trunk.

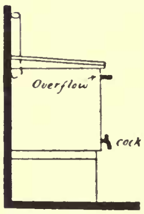


(61a)—When the roof water is collected into the cisterns in the roof it may be conducted either with a 4 in. lead pipe or along lead-lined deal trunks thus:—

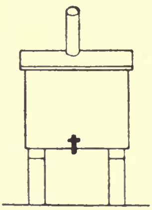
Form 1 in. (or $1\frac{1}{4}$ in.) rough deal grooved and rebated water trunks from cesspools to cistern, 9 in. deep by 9 in. wide, with $1\frac{1}{2}$ in. drips and all supports. The ends to be turned down into cistern. Line with 5 lb. lead, copper nailed 6 in. apart on top edges, and put an 1 in. rough deal top with ledges, in movable lengths.

Rain-water cistern or water butt.

(**62**)—When the rain water is collected outside the house, the cistern may be in galvanised iron of sufficient capacity, fixed on brick or iron bearers. The only fittings necessary would be a $\frac{3}{4}$ in. (or 1 in.) draw-off tap, a short length of overflow (or warning pipe) and a deal movable cover.



A water butt, banded round in iron, may be used with draw-off and overflow in lieu of a galvanised iron tank.



When a rain-water cistern is required to serve the draw-offs in the house, the cistern should be placed in the house as high up as possible, to catch the rain water from the roofs, which would be brought to it either by lead-lined troughs or 4 in. lead pipes from the various gutter outlets, as mentioned in clause No. 61a. The fittings in this case would be exactly the same as in an ordinary drinking-water cistern, see clause No. 30, but with the overflow taken over a hopper head down to a gully.

This cistern may be in lead if convenient, as in clause No. 61. The outgo in either case should be (say) 3 in. up from the bottom, as there is much sediment with rain water from roofs.

The rain-water cistern, if placed in the roof to catch the rain water from the roof, could not discharge its overflow on to the roof owing to the cistern being at a lower level than the roof, hence the necessity of taking the overflow down to a lower level. Rain water attacks iron. If the rain water be used for drinking purposes, no leadwork of any description should be allowed to come in contact with the water, galvanised iron cistern and pipes only being used, see notes to clause No. 1. The jointing of the pipes may be made with whiting, boiled oil and varnish.

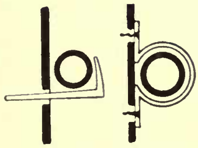
There are various rain-water separators which assist in getting rid of most of the dirt from the roofs before the rain water is allowed to discharge into the cisterns.

Hot Water Supply.

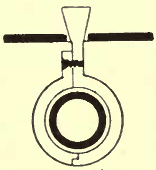
(Clauses Nos. 63 to 65.)

Generally.

(**63**)—All hot-water piping to be kept 2 ft. away from cold-water pipes, and where exposed to view on the face of the work to be painted three coats in oil colour and decorated to match the other work, and painted two coats in oil colour where not exposed to view, such as under floors and in roofs. (See Carpenter, clause No. 41, for wood casings to pipes.)



Wall hook *Band.*



Patent Clip.

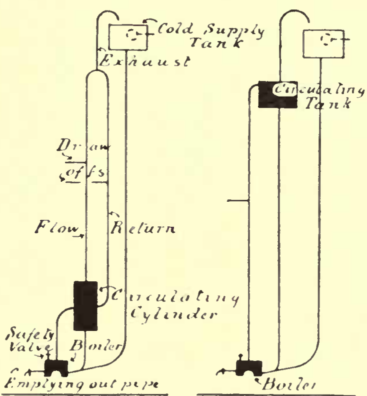
The pipes to be in galvanised wrought-iron, welded steam tubing, with all tees, bends, angles, crosses, unions, screwed joints, elbows, pipe brackets, reducing sockets, caps, plugs, wall hooks, clips, bands and other connections and fastenings. The joints to be made with red lead cement, and the tubing fixed to walls with wall hooks and to woodwork with iron bands, but in all positions where passing through rooms and passages, with iron bands (or patent clips).

All pipes to be laid to falls so that the whole of the tubing may be emptied, and where in exposed situations and against external walls, bound round with dry hair felt and canvas (or silicate felt).

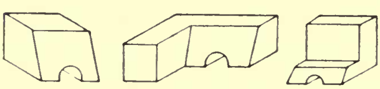
Floor boards covering up tubing to be fixed with brass cups and screws, with access traps over. No floor joists or main timbers to be cut or bored through except immediately against the walls, and then only $\frac{1}{2}$ in. down.

The patent iron clips keep the pipes away from the walls, which is an advantage.

Practically there are two ways of supplying hot water to a building, the only difference being the position of the circulating tank, as shown by the sketches. A quicker and hotter supply is obtained by placing the circulating tank near the boiler than if being placed in a roof. The circulating tank may either be a square tank or a cylinder, preferably a cylinder.

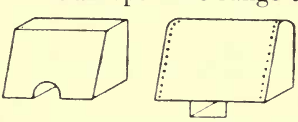


In a close-fire range the high-pressure boiler for the hot-water circulation may be a back boiler with arch flue, an L-shaped boiler with arch flue, or a boot boiler with arch flue, all of which should be of welded wrought iron and provided with manholes.



Back Boiler *L shaped Boiler* *Boot Boiler*

In an open-fire range the boiler may be in welded wrought iron, with arch flue and manhole, or in riveted wrought iron with manhole, and the flue formed under in firebrick.

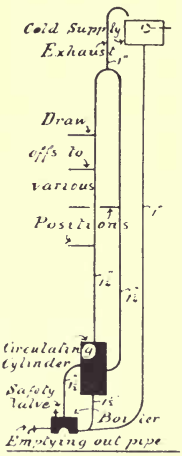


The flow pipe should rise continuously from the top of the boiler, and the return pipe always fall to the bottom of the boiler, neither being allowed to rise and fall alternately.

The exhaust pipe must always be higher than the cold-water supply tank.

Here is a description of the hot-water supply to a house, with the circulating cylinder placed near the boiler:—

Hot-water circulation with close-fire kitchen range, high-pressure boiler and cylinder.



(**64**)—Fix in kitchen range, the full width of fire, a $\frac{3}{8}$ in. (or $\frac{5}{16}$ in.) plate wrought-iron, high-pressure, welded boot boiler, with manhole and arch flue, drilled for pipe connections (see Smith, clause No. 91), and provided with an 1 in. (or $1\frac{1}{4}$ in.) dead weight safety valve, and 1 in. emptying-out pipe with gun-metal stop-cock.

Connect with boiler $1\frac{1}{2}$ in. ($1\frac{1}{4}$ in., $1\frac{3}{4}$ in., 2 in. or 1 in.) flow and return pipe to a 50 (20, 30 or 60) gallon $\frac{1}{8}$ in. plate galvanised iron, riveted circulating cylinder, with manhole, fixed on cast-iron brackets near boiler, and cased round with asbestos cement on wire frame. The flow pipe to be flush with the under side of top of boiler.

Take from circulating cylinder an $1\frac{1}{4}$ in. (or 1 in.) flow and return pipe, somewhat higher than topmost draw-off, and continue with $1\frac{1}{4}$ in. (or 1 in.) exhaust pipe turned over cold-water supply cistern. The flow pipe to be flush with the under side of top of cylinder.

Branch off from flow pipe 1 in. separate supplies to each bath, and provide with gun-metal bib-cock, p.c. 10s. each (or else attach the pipes to the bath fittings).

Branch off from flow pipe $\frac{3}{4}$ in. separate supplies to

Each housemaid's sink,
Each butler's sink,
Each scullery sink,
Dispensing sink,
Slop sink,
Draw-off on landing,
Each washing trough,
Cook's hand lavatory,
Each lavatory,

and finish each position with gun-metal bib-cocks, p.c. 10s. each.

In this method of hot-water circulation the draw-offs may be taken either from the flow or return pipe, but preferably from the flow.

Hot water is to be drawn at once in every case, no dead water being allowed to remain in the pipes, the branches off the flow pipe will therefore, in some cases, also have to be connected with the return pipe. With supplies to baths a short length of dead water will be allowed.

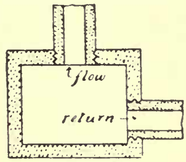
For cold supply to kitchen boiler, see clause No. 30.

Also see sketch to clause No. 28.

Pipes for the various parts of a hot-water circulation are usually ½ in., ¾ in., 1 in., 1¼ in., 1½ in., 1¾ in. and 2 in. diameters, according to their positions.

In a close-fire kitchen range a boot boiler is preferable, as it gives more flue surface exposed to the fire.

The flow pipe should always be taken from the top of the boiler, otherwise air is liable to get locked up. The return pipe should be brought down to within an inch or so of the bottom of the boiler.



The asbestos cement covering round the circulating cylinder prevents loss of heat in the circulation and excess of heat in the kitchen.

State if the circulating cylinder is cased in with wood framing, doors, hinges and fastenings similar to a gas meter; see Gasfitter, clause No. 6.

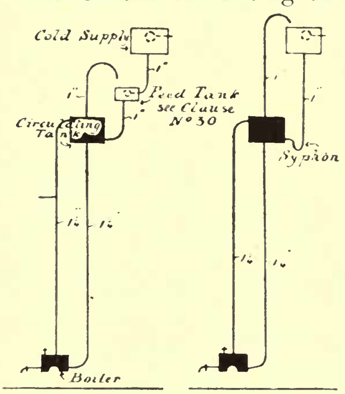
It is an open question whether a safety valve is of much service, as it usually gets fixed and consequently becomes useless.

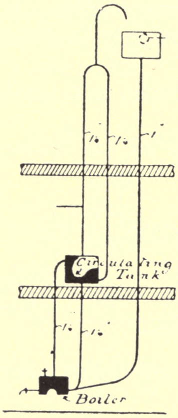
With some hard waters the boiler and pipes as far as the circulating cistern become furred up in time, and require cleaning out at short periods.

In an open-fire range the description of the high-pressure boiler may be:—

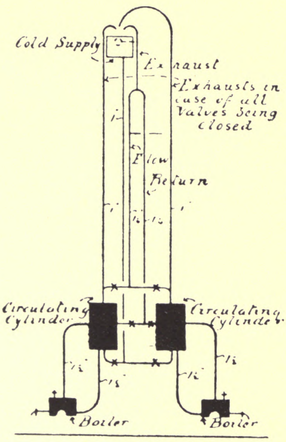
> Supply kitchen range 3 in. longer than the full width of fire with a high-pressure ⅜ in. (or $\frac{5}{16}$ in.) plate riveted wrought-iron boiler (say) 3 ft. 3 in. long × 2 ft. high × 9 in. to 6 in. wide, with manhole, and with holes drilled for pipe connections (for sketches, see Smith, clauses Nos. 94 and 93), and provided with an 1¼ in. (or 1 in.) dead weight safety valve, 1 in. emptying-out pipe with gun-metal stop-cock. Form flue under and at back in fire-brick with damper. The description of the circulating pipes and cylinder would remain the same as with a close-fire range boiler.

When the circulating tank is placed in the roof the arrangement would be as either of the two sketches. But in each case it is better to bring the cold supply separate and direct to the boiler. The feed tank shown in the one sketch, and the syphon shown in the other, is to prevent any back circulation of hot water finding its way into the cold-water supply tank, the first method being the most satisfactory. But of course if the cold supply is taken down direct to the boiler as shown on page 429 then there will be no question of any back circulation of hot water into the cold-water supply tank. When the circulation tank is placed in the roof, the draw-offs must only be taken from the flow pipe.





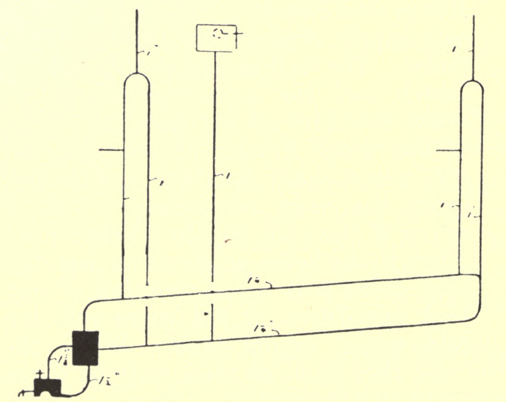
Here is a sketch showing the circulating tank fixed in a bath-room or linen closet, the advantage being that the heat from the tank helps to warm the apartment in question.



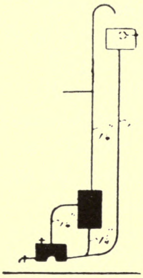
When a large amount of hot water is required, boilers may be placed both in the kitchen and scullery ranges, and two circulating cylinders provided and arranged with stop-cocks so that either or both boilers and cylinders may be used; or that either boiler and cylinder may be cleaned out or repaired independently of the other.

Circulating cylinders are made in 16, 14 and 12 B.W.G., and $\frac{1}{8}$ and $\frac{3}{16}$ in. plate iron. Here are some sizes:—

15 in.	diam.	× 30 in.	high	contains	20 galls.
15 in.	„	× 48 in.	„	„	30 „
18 in.	„	× 42 in.	„	„	40 „
20 in.	„	× 42 in.	„	„	50 „
22 in.	„	× 48 in.	„	„	60 „



When hot water is required at opposite ends of a building, the pipes may be arranged with two branch flows and two branch returns, as shown on sketch.



For a very small house of no great height, the pipes may be arranged with the draw-offs taken from the exhaust pipe, so long as the draw-offs be not very high up.

It is a very good plan in a large house or establishment to have an independent separate heating boiler for the hot-water circulation, with a fire entirely to itself.

The circulating tank, when placed in the roof or on an upper floor, should be provided with a safe in case of leakage, similar to that under clause No. 30.

Circulating tanks	18 in. × 18 in. × 18 in.	contain about	20	galls.
„	24 in. × 16 in. × 18 in.	„	25	„
„	24 in. × 18 in. × 20 in.	„	30	„
„	26 in. × 18 in. × 24 in.	„	40	„
„	30 in. × 20 in. × 24 in.	„	50	„
„	30 in. × 24 in. × 24 in.	„	60	„

They are made in 16, 14 and 12 B.W.G., and $\frac{1}{8}$ in. and $\frac{3}{16}$ in. plate full.

When a circulating tank is used in lieu of a cylinder, the capacity should be about the same.

Repairs generally. (65)—Clean out all cisterns, boilers, pipes, baths, sinks, traps and wastes. Regrind all cocks. Clean out w.c. pans, oil and adjust the apparatus and fittings, and put in working order.

Lead weatherings to sills and strings. (66)—Cover the string courses and sills with 5 lb. lead weathering wedged in.

ZINCWORKER.

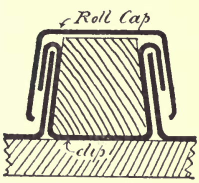
Generally. (**1**)—The zinc roofing to be of the best tough malleable sheet zinc, even in colour and texture, and laid upon the latest and most approved method. No nails or solder to be used in any part.

Wood rolls. The wood rolls to be $1\frac{3}{4}$ in. × $1\frac{3}{4}$ in. twice splayed deal fillets, spaced 2 ft. $10\frac{1}{2}$ in. centres.

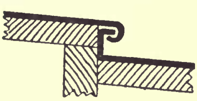
Drips. The drips to be $2\frac{1}{2}$ in. (or 3 in.) deep to flats, and $1\frac{1}{2}$ in. (or 2 in.) to gutters, and spaced not more than 7 ft. 6 in. apart.

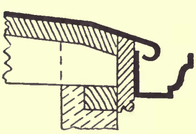
Pitch. The pitch to be not less than 4°, or height of roof about one-twenty-ninth the span.

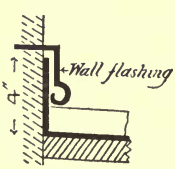
Flat. (**2**)—Cover the flat over kitchen offices with No. 15 (Nos. 14 or 16) gauge sheet zinc, laid to falls of 2 in. in 8 ft., turned up 4 in. against walls and kerbs, with all laps, clips and passings. Dress up and secure with zinc clips every 3 ft. apart against $1\frac{3}{4}$ in. × $1\frac{3}{4}$ in. twice splayed deal rolls (fillets) spaced at 2 ft. $10\frac{1}{2}$ in. centres. Form drips $2\frac{1}{2}$ in. (or 3 in.) deep with the zinc turned up and overlapped, with a beaded edge. Cap the rolls with No. 15 (Nos. 14 or 16) gauge zinc roll caps, secured with fork connections with patent saddle pieces (plates) and stopped ends. Put No. 15 gauge (Nos. 14 or 16) zinc ridge roll cap, beaded on both edges, over $3\frac{1}{2}$ in. × 2 in. rounded deal ridge roll. The eaves to be splayed off sharply and finished with a beaded edge.

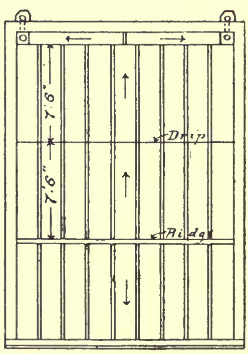


Roll


Drip


Eaves



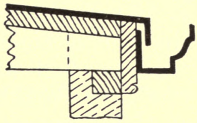


Flashings, stepped flashings and aprons to be in No. 14 gauge zinc, beaded on edge, wedged and pointed up in cement.

Cover box gutter with No. 16 gauge sheet zinc, turned up on either side, with drips $1\frac{1}{2}$ in. (or 2 in.) deep; form cesspools and 4 in. outlets.

For boarding and felt under the zincwork, see Carpenter, clauses Nos. 115 and 116 respectively.

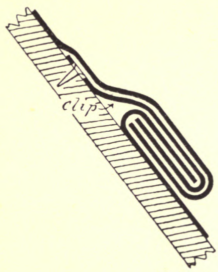
The eaves may be finished with a plain lap.



Zinc roofing should only be used in the cheaper class of building. It must not come in contact with lead, copper, iron, lime, or wood containing acid. The sea air is said to cause zinc to perish after a time.

Zinc is made in sheets 6 ft., 7 ft. and 8 ft. long by 2 ft. 8 in. and 3 ft. wide, in gauges from Nos. 1 to 26; Nos. 9 to 18 being those mostly employed in buildings. Gauges Nos. 13, 14, 15 and 16 are suitable for roofs and flats; Nos. 14, 15 and 16 for gutters; and Nos. 10, 11 and 12 for cheaper and temporary buildings.

Zinc gauge No.	10	weighs per foot super.	about	$11\frac{1}{2}$ oz.
„	11	„	„	$13\frac{1}{4}$ „
„	12	„	„	15 „
„	13	„	„	17 „
„	14	„	„	$18\frac{3}{4}$ „
„	15	„	„	$21\frac{3}{4}$ „
„	16	„	„	$24\frac{3}{4}$ „



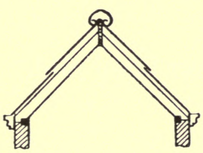
In roofs with a pitch of not less than one-seventh the span the drips may be dispensed with, the horizontal joints of the sheets being secured together with a welt or fold.

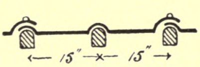
Aprons, soakers, flashings and valleys to slated or tiled roofs.

(3)—To be in No. 14 (or No. 15) gauge zinc. Describe the widths similar as if in lead. See Plumber, clause No. 3.

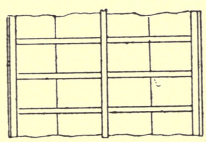
It is only in poor class work that zinc is used in these positions.

Italian roofing.





(4)—Cover roof with No. 15 (Nos. 14 or 16) gauge sheet zinc, laid with Italian corrugations, and secured to rafters (or rolls) with mushroom-headed screws upon bossed sockets, and turn up 4 in. against walls and kerbs. The horizontal joints to be formed with a welt.

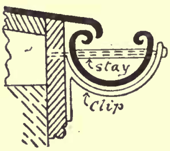


Then describe the flashings, ridge rolls and eaves similar to clause No. 2.

This form of zinc roofing is generally laid to roofs with a fairly steep pitch, and may be laid without boarding, the roof rafters being spaced at 15 in. centres, and rounded to receive the corrugations. If Italian corrugations be laid with rolls on a boarded roof, they should be 2 in. × $1\frac{3}{4}$ in. spaced at 15 in. centres.

If a zinc flat be laid with Italian corrugations, then there must be drips similar to clause No. 2.

Eaves gutters.



(5)—To be formed with No. 15 (Nos. 14 or 16) gauge zinc, half round (or Ogee) pattern, $3\frac{1}{2}$ in. wide, with hollow zinc stays every 18 in. apart, and secured to fascia with screws driven through the stays (or with clips in addition). Form all nozzles, ends and angles.

Zinc guttering is only used in inferior work and outbuildings. It is made in $2\frac{1}{2}$ in., 3 in., $3\frac{1}{2}$ in., 4 in., $4\frac{1}{2}$ in. and 5 in. widths.

Rain-water pipes. (6)—Carry down (say) four 3 in. diameter rain-water pipes from gutters to ground level, with all bends, shoes, heads and connections in No. 15 gauge zinc.

Zinc rain-water pipes are only used in inferior work and outbuildings. They are made 2 in., $2\frac{1}{2}$ in., 3 in., $3\frac{1}{2}$ in., and 4 in. diameters.

Zinc-lined cisterns. (7)—Line cistern with No. 12 (Nos. 13 or 14) gauge sheet zinc, soldered at angles, and tacked on the upper edges. Form outlets and connections for pipes.

Zinc-lined cisterns are only used in very inferior work. For lead-lined and galvanised iron cisterns, see Plumber, clauses Nos. 61, 30 and 49 respectively.

Zinc pipe. (8)—The sparge pipe to urinal to be $\frac{3}{4}$ in. (or 1 in.) diameter, out of 21 oz. (No. 15 gauge) zinc, soldered at ends and perforated with $\frac{1}{8}$ in. diameter holes every $\frac{3}{4}$ in. apart.

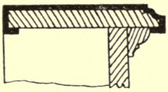
Also see Plumber, notes to clause No. 56, and Coppersmith, clause No. 4, for sparge pipes.

Tin pipe. (9)—

$\frac{1}{2}$ in.	pipe	to weigh	18 oz.	per lineal	yard.
$\frac{3}{4}$	”	”	32	”	”
1	”	”	48	”	”
$1\frac{1}{4}$	”	”	64	”	”
$1\frac{1}{2}$	”	”	80	”	”

Tin pipe is used in public-house bar fittings, see Carpenter, clause No. 318.

Pewter to counter.



(**10**)—Cover the counter top and edges with polished sheet pewter weighing $3\frac{1}{2}$ lbs. per super. foot, with bevel soldered joints, and edges copper nailed on the under side.

Pewter covering to counters is chiefly used in public-houses and hotel bars, see Carpenter, clause No. 318.

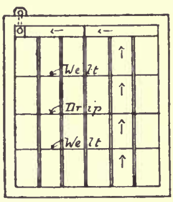
COPPERSMITH.

Sheet copper is rolled in sheets 4 ft. long by 2 ft. and 3 ft. 6 in. wide, in gauges Nos. 1 to 30 B.W.G.; but when employed as a roof covering to flats it is specially rolled in sheets about 5 ft., 6 ft., 7 ft. and 8 ft. long, by 3 ft. wide.

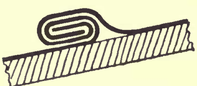
Sheet copper weighing from 12 to 20 oz. per super. foot is mostly used for roofs, flats and gutters.

Copper of B.W.G.	No.	18	weighs per foot	super.	36 oz.
,,	,,	20	,,	,,	26 ,,
,,	,,	22	,,	,,	20 ,,
,,	,,	24	,,	,,	16 ,,
,,	,,	26	,,	,,	12 ,,
,,	,,	28	,,	,,	8 ,,
,,	,,	30	,,	,,	6 ,,

Flats (or roofs) and gutters.



Roll



Welt

(**1**)—Cover the main flat (or roof) and gutters with malleable sheet copper No. 24 B.W.G., 16 oz. per super. foot, laid to falls of 2 in. in 8 ft., with all ties, nails, seams, clips, flashings, aprons and roll caps.

The roll caps to be welted on both sides to $1\frac{3}{4}$ in. $\times 1\frac{3}{4}$ in. (or $1\frac{1}{2}$ in. $\times 1\frac{1}{2}$ in.) twice splayed deal rolls (fillets) spaced at 2 ft. $9\frac{1}{2}$ in. centres. The stopped ends to rolls to be welted all round, and the saddle ends welted to the sheets above.

Form the horizontal jointing to the sheets about every 5 ft. (or 4 ft.) with a double welt, and form the drips about every 10 ft. (or 8 ft.) apart, 2 in. deep, also with a welted joint.

Turn up the sheets 4 in. against walls and kerbs, with the flashings over finished a welted edge, and wedged and pointed up where against brickwork in cement. Form cesspools and 4 in. outlets. The eaves to be sharply splayed off.

Copper roofing laid in the manner described is very similar to zinc roofing, except that the jointing of the sheets is made with welts. For boarding and felt under the copper, see Carpenter, clauses Nos. 115 and 116 respectively. The least pitch desirable is 3° 50′ or height of roof one-thirtieth the span. It is safer to put a drip to each length of sheet, if a flat have a small fall, otherwise the welted horizontal joints are perfectly secure.

If it is desired to dispense with the wood rolls, then the copper roofing may be laid with welted joints in every part both vertically and horizontally, but the flat must have some considerable fall, say one-seventh the span.

Copper is not liable to "creep" down a roof having a steep pitch, as is the case with sheet lead.

Turret tops and small domes are often covered with sheet copper of the same substance as that used for flats and roofs. The horizontal joints should be welted together, and the joints at the angles should be covered with a "verandah" capping as sketch.

Verandah capping is usually rolled about 1 in., $1\frac{3}{16}$ in. and $1\frac{3}{8}$ in. wide.

After a time, copper exposed to the elements will get covered with a film of carbonate, commonly known as verdigris. If it be desired to obtain this green effect on a dome without waiting for it to colour naturally, then the copper may be payed over with spirits of salts; but this will materially affect the life of the copper.

Lightning Conductors.

Of the cheaper metals copper has been considered the best material for a lightning conductor, following on in conductivity are zinc, iron, tin and lead, in the relative proportions of 12, 4, 2, $1\frac{1}{2}$ and 1. Copper, therefore, is twelve times as efficient as lead. Lightning conductors should be taken down the wet side of a building, terminating in a wet place in the ground, and kept away from all gas and soft metal pipes and electric light wires. Sharp bends in the conductors should be avoided.

Iron lightning conductors should weigh not less than $2\frac{1}{4}$ lbs. per foot run, and may either be in plain iron or galvanised, but in both cases it should be painted, and attached at the foot to a galvanised iron plate buried in the ground.

Solid iron lightning rods may be $\frac{1}{2}$ in. or $\frac{3}{4}$ in. diameter, but if in the form of iron bars, then $2\frac{1}{2}$ in. (or 2 in.) $\times$ $\frac{3}{8}$ in.

Rods should be screwed at joints and bars scarfed and riveted.

Professor Lodge recommends iron as a lightning conductor in preference to copper. Although copper is the greater in conductivity, iron has a higher fusing point and greater specific heat, and therefore an iron conductor is capable of taking a larger amount of electrical energy (or current) and getting rid of it more quickly. There is also a question as to whether the current taken by a large copper conductor does not oscillate up and down the conductor before it is discharged into the earth, which in the case of iron it is not so liable to do.

Copper lightning conductors may be formed of solid rods, hollow tubes, wire rope or solid tape (ribbon), the tape being preferable. Solid copper rods are made $\frac{3}{8}$ in., $\frac{1}{2}$ in., $\frac{5}{8}$ in. and $\frac{3}{4}$ in. diameters and copper tubes in 1 in. and $1\frac{1}{8}$ in. diameters $\frac{1}{8}$ in. metal; the joints should be screw and socket, and soldered.

Copper wire rope is made in $\frac{3}{8}$ in., $\frac{1}{2}$ in. and $\frac{5}{8}$ in. diameters.

Copper ribbon (tape) is made:—

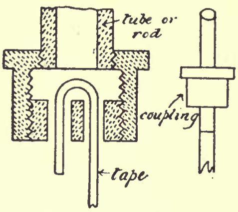
$\frac{5}{8}$ in. × $\frac{1}{12}$ in.	weighing per foot run	about	4·83 oz.
$\frac{3}{4}$ in. × $\frac{1}{8}$ in.	"	"	5·80 "
1 in. × $\frac{1}{8}$ in.	"	"	7·73 "
$1\frac{1}{4}$ in. × $\frac{1}{8}$ in.	"	"	9·67 "
$1\frac{1}{2}$ in. × $\frac{1}{8}$ in.	"	"	12·69 "
2 in. × $\frac{1}{8}$ in.	"	"	15·46 "
$2\frac{1}{2}$ in. × $\frac{1}{8}$ in.	"	"	19·33 "

The joints of copper tape should be scarfed, riveted and soldered.

Copper wire rope is not so much used, as the small copper wire strands become destroyed.

Copper lightning conductors should weigh not less than 6 oz. per foot run, and should be attached at the foot to a copper plate in the ground.

Lightning conductor.



Section *Elevation*

(**2**)—Affix to the highest chimney a $\frac{3}{4}$ in. × $\frac{1}{8}$ in. solid copper tape lightning conductor in one continuous length without joints, carried through (or round) the string courses and insulated, with copper eyes 3 ft. apart, so as to firmly hold but not to pinch the tape.

Finish the upper end of tape with a solid copper pointed rod 3 ft. above chimney, with the rod carried 5 ft. down and secured to the tape with a coupling. Encase the lower end of tape for 10 ft. (or 8 ft.) above ground in a painted galvanised iron pipe, and carry down 4 ft. (to 6 ft.) below ground in a similar pipe, and continue on for 10 ft. (or 15 ft.) along ground away from the walls, and connect to a 3 ft. × 3 ft. × $\frac{1}{8}$ in. (or $\frac{1}{16}$ in.) copper plate, buried in a bed of moist powdered coke 3 ft. wide, 5 ft. deep, 6 ft. long. There is not to be more than 10 per cent. alloy in the copper.

If the copper band be not in one continuous length, the joints should be scarfed, riveted and soldered together. The copper plate at the lower end of the tape may also be bedded in cinders, in a well, a running water-course or a drain.

Two lightning conductors will be sufficient for a building 45 ft. long; and if over 45 ft. long, they should be placed every 30 ft. apart.

Copper wire cord.

(**3**)—Copper wire cord for sash lines is made in:—

$\frac{1}{4}$ in., $\frac{3}{8}$ in., $\frac{1}{2}$ in., $\frac{5}{8}$ in., $\frac{3}{4}$ in., 1 in., $1\frac{1}{8}$ in. and $1\frac{1}{4}$ in. diameters, with a working load of 34, 50, 75, 112, 168, 224, 336 and 448 lbs. respectively.

Sparge pipe.

(**4**)—See Zincworker, clause No. 8; and Plumber, notes to clause No. 56.

Copper pipes $\frac{3}{4}$ in. and 1 in. bore are made in $\frac{1}{16}$ in., $\frac{1}{8}$ in., $\frac{3}{16}$ in. and $\frac{1}{4}$ in. metal.

PLASTERER.

A cubic foot of plaster composed of lime, sand and hair, weighs about 86·5 lbs.

Sand. (1)—See Excavator, clause No. 24.

Lime. (2)—To be best white (or grey) chalk lime, well slaked and screened.

Hydraulic limes are not used in plastering, as they are liable to blow.

Selenitic lime. (3)—To be selenitic lime, used and mixed in accordance with the printed instructions of the Company supplying it.

This class of lime is only used in special cases of plastering.

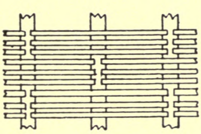
Portland cement. (4)—See Excavator, clause No. 23.

Roman, Medina and similar cements are not so strong as Portland cement, and are seldom now used. But Medina cement may be used as an external rendering if the work is required to be painted immediately, for if Portland cement be used under these circumstances it would kill the paint.

Hair. (5)—To be best long back bullock's hair, well beaten and free from grease and dirt.

Goat's hair may be used in very special first-class work.

Laths. (6)—The lathing to be executed with "lath-and-half" laths, rent out of the heart of the best red Baltic fir, and free from sap and knots. The laths to be fairly straight, and butt jointed, with the joints frequently broken (say every 3 ft.), and secured with good galvanised cut wrought-iron lathing nails. Laths to be spaced about $\frac{3}{8}$ in. (to $\frac{5}{8}$ in.) apart.



Laths are split about 1 in. wide in three thicknesses, "single laths" being about $\frac{1}{8}$ in. to $\frac{3}{16}$ in. thick; "lath-and-half" laths, about $\frac{1}{4}$ in. thick; and "double laths" about $\frac{1}{2}$ in. to $\frac{3}{8}$ in. thick. "Single laths" are used in cheap work, and are sometimes lapped at joints; the other two classes of laths are used in good work, but should never be lapped at joints. Laths are sometimes in oak.

Lathing nails are either of wrought, cut or cast iron. Cut nails are generally used with fir laths, and wrought nails with oak laths. Zinc nails are also sometimes used with fir laths. Copper nails may be used for the best work. When iron nails are used which have not been galvanised, the heads should be painted over before the plastering is done.

Thickness of plastering.

(**7**)—The plastering, when finished in three-coat work, is not to be less than 1 in. ($\frac{3}{4}$ in., $\frac{7}{8}$ in., or $1\frac{1}{4}$ in.) thick.

Internal plaster.

(**8**)—To be composed of 2 (or 3) parts sand, 1 part lime, mixed with 1 lb. hair to 1 bushel of lime (or 1 lb. hair to 2 (or 3) cubic ft. of plaster). The setting coat to be finished in pure lime, run into putty one month before using. (The setting coat may have a little washed sand mixed with it. Many plasterers prefer it.)

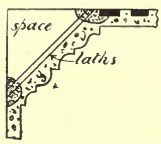
This is the class of plaster ordinarily used in all good internal plaster work.

Cornices and coves.

(**9**)—To be run out of 1 part pure lime to 1 part plaster of Paris, on a rough plaster backing, and finished to true metal moulds. Cornices with from $2\frac{1}{2}$ in. to 4 in. projection to be made out with Scotch bracketing as a backing, and beyond 4 in. projections with $1\frac{1}{2}$ in. (or 2 in.) rough deal brackets every 12 in. apart, cut out roughly to the shape of the cornice or coves, and lathed over. Form all mitres, irregular mitres, stopped ends, ends on splay, returned and mitred ends and circular angles.

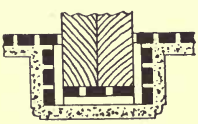
Also see Carpenter, clause No. 39.

"Scotch bracketing" consists in fixing short lengths of laths anglewise, with the ends pushed into roughly formed plaster screeds.



Counter lathing.

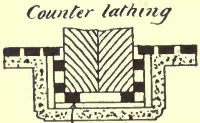
(**10**)—Lath and counter lath to beams over 3 in. wide where plastered.



Counter lathing

or,

Batten out beams over 3 in. wide with 1 in. × 1 in. fillets to receive the lathing.



battens

Arrises. (11)—Run all arrises and angles in "neat" Keene's (Parian or Martin's) cement (or plaster of Paris) 2 in. (or 3 in.) wide on a backing of Portland cement and sand in equal proportions.

Circular work. (12)—Form the circular work to true curves.

Cracks and blisters. (13)—Cut out all cracks and blisters, and make good in plaster of Paris.

If the work is finished in Parian, Keene's or Martin's cement, as in clause No. 21, cracks and blisters should be made good in a similar class of cement.

Make good plaster. (14)—Make good in plaster of Paris to shelves, handrails, brackets, chimney pieces, and to other work fixed after the plastering has been finished.

Also see clause No. 4 under Electric Lighting.

Clauses Nos. 15 to 18 should come more properly under Painter, as also clauses Nos. 59 to 62, references to which will be found in Painter.

Whitewash (limewhite). (15)—To be composed of white fat lime, Russian tallow and water.

Used mostly for cellars, roof timbers, sheds and walls in common work, either internally or externally.
Also see clauses Nos. 16, 93 and 94 in Bricklayer.

Whitening. (16)—To be made in the proportion of 6 lbs. whiting, 1 quart double size, water and a small amount of blue black.

Used chiefly on ceilings and cornices internally.

Colouring. (17)—To be composed of whitewash with a colouring pigment.

Used both for inside and outside work.
See clause No. 95 in Bricklayer.

Distemper. (18)—To be made in the proportion of 6 lbs. whiting, 1 quart size, water, a colouring pigment, and a small amount of alum (or soft soap).

Used both on ceilings and walls internally.

Lime stucco for external work. (**19**)—To be composed of 3 parts sand to 1 part hydraulic lime.

Cement stucco for external work. To be composed of 1 part Portland cement to 3 (or $2\frac{1}{2}$) parts sand.

Rough cast lime stucco. Rough cast lime stucco to be composed of 2 parts pure lime to 1 part sand, with small pebbles mixed up together with it.

Rough cast Portland cement stucco. Rough cast cement stucco to be composed of 1 part Portland cement to 3 (or 4) parts sand, with small pebbles mixed up together with it.

Lime stucco, whether plain or rough cast, is suitable for external work, but seldom now used, Portland cement stucco having taken its place. See clauses Nos. 68 to 71.

Plain lime stucco may be "common stucco," that is with 3 parts sand to 1 part hydraulic lime;

Trowelled stucco composed of 2 parts pure lime to 1 part sand;

Bastard stucco composed of 2 parts pure lime to 1 part sand, and a small quantity of hair.

Pebble dash work is formed by throwing small clean pebbles on the surface of the stucco.

Clauses Nos. 20, 21, 3 and 77 refer to special work only, and clauses Nos. 1, 2, 4 to 19, 22 to 76 to ordinary work.

Gauged plaster for special work. (**20**)—To be composed of 3 (or 2) parts sand, 1 part lime, with 1 lb. hair to 1 bushel of lime (or 1 lb. hair to 2 (or 3) cubic ft. plaster), and mixed with 1 part plaster of Paris. The setting coat to be composed of 1 part pure lime putty to 1 part plaster of Paris.

or,

Gauged plaster may be composed of 2 (or 3) parts sand, 1 part lime, with 1 lb. hair to 1 bushel of lime (or 1 lb. hair to 2 (or 3) cubic ft. plaster), and mixed with 1 part Portland cement. The setting coat to be composed of 1 part pure lime putty and 1 part plaster of Paris.

A lime setting coat on a backing of Portland is liable to shell off, it is better to finish the setting coat in Keene's cement.

Gauged plaster is used when the work is required to dry out quickly, and when on lath work it should be gauged rather stronger, as it takes longer to dry than when used on walls.

Cornices to gauged plaster-work are finished in exactly the same way as ordinary plaster cornices, see clause No. 9, but on a rough gauged plaster backing. Gauged plaster coves are finished as other gauged plaster-work, as described in this clause.

When gauged plaster is finished with Keene's cement and has to be painted, the work should remain a while, otherwise the Portland cement will show through, but the first coat of paint should be put on at once, and the remaining coats left for some short time.

Parian, Keene's, Martin's or Robinson's cement plaster. **(21)**—To be used in the proportion of 3 (or 2) parts sand to 2 (or 1) parts Parian (Martin's, Robinson's or Keene's) cement, the finishing coat being in the neat cement.

Keene's cement is mostly used, but Parian is considered best.

These cements are used as plaster where work is required to be decorated very soon after finishing. They are only suitable for internal work. Parian and Keene's are mostly used, and can, if required, be finished with a polished face. When the work is finished to receive paint, state that the cement is to have a coat of paint laid on almost immediately, and before it has time to dry; the remaining coats may be put on shortly after. Cement cornices and coves to this class of work are finished in the same way as the other cement plaster-work in this clause. Parian, Keene's, Martin's and Robinson's cements may also be finished neat on a backing about ¾ in. thick of 1 part Portland cement to 2 parts sand; but if finished with paint, only the first coat should be laid on at once, the remaining coats being put on some time afterwards.

Ceilings. **(22)**—Lath with "lath-and-half" laths, plaster, float and set ceilings on all floors to all rooms, passages, lobbies, halls, landings and soffits.

State if "single" or "double" laths be required. See notes to clause No. 6.

For special work ceilings may be plastered in gauged stuff or cement, as clauses Nos. 20 or 21.

Lath and plaster one coat is only used in rough situations, such as between the roof rafters, to keep out cold; or to the under side of ground floor joists when there is sufficient space under to do it; or to cellar ceilings; but it is never done in gauged plaster-work or cement as described under clauses Nos. 20 and 21.

Lath, plaster and set is used in inferior work, the plaster being scratched over with a birch broom before the setting coat is applied. It may either be done in ordinary plaster as clause No. 8, or in gauged plaster or cement as in clauses Nos. 20 and 21.

Lath, plaster, float and set is used in all ordinary and good class work, the plaster coat being pricked over with a scratching tool, and the floating coat scratched over with a birch broom. It may either be done in ordinary plaster as clause No. 8, or in gauged plaster or cement as in clauses Nos. 20 and 21.

Fire and sound resisting ceiling. **(23)**—See clause No. 57 under Carpenter. Then describe the plastering as in clause No. 22.

Cellars and boiler-house ceiling.

(**24**)—Lath with "single laths," and plaster one coat the ceilings and soffits to these positions.

Plaster under ground floor joists.

(**25**)—Same as clause No. 24.

Plaster between roof timbers.

(**26**)—Plaster one coat to the slate or tile battens between the roof rafters.

In slated roofs it is necessary to lath in addition.

Also see notes to clause No. 2 under Tiler; and notes to clause No. 6 under Slater; and notes to clause No. 1 under Stone Tiler.

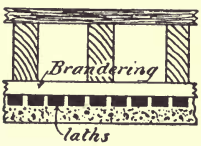
If the roof is boarded on the outside, then lathing must be taken across the roof timbers.

Ceilings to concrete floors and soffits of stairs.

(**27**)—Hack over surface of concrete ceilings and soffits to stairs, and render float and set in plaster.

It is almost better to do plastering to concrete floors in gauged stuff as clause No. 20. It may also be done as clause No. 21, if required, and also as clause No. 51.

Brandering.

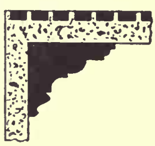


(**28**)—All ceilings on all floors to all rooms, passages, lobbies, halls, landings and soffits to be covered with brandering, formed with 1 in. × 1 in. battens 12 in. (to 14 in.) apart, spiked to joists, then lathed with "lath-and-half" laths, plastered, floated and set.

When the joists are somewhat wide this brandering or battening will afford a better key to the plaster. The work may be finished in gauged plaster, or cement, as clauses Nos. 20 or 21.

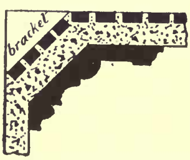
Also see notes under clause No. 22 for finishing plaster ceilings in other ways to other positions.

Cornices, second floor.



(**29**)—Run plain moulded plaster cornices to all rooms on second floor, 8 in. girth, on rough plaster backings

Cornices, first floor.

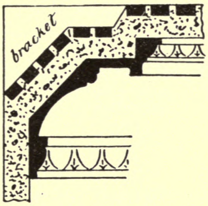


(**30**)—Run plain moulded plaster cornices to all rooms on first floor, 10 in. girth, on deal brackets and plaster backings.

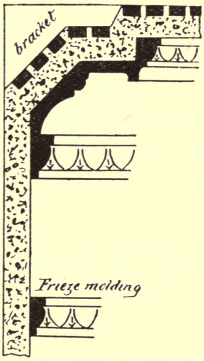
State if any member is enriched, and the class of enrichment.

Cornices, ground floor.

(**31**)—Run an enriched moulded plaster cornice to dining-room, drawing-room, breakfast-room and billiard-room (or other best rooms), 12 in. girth, on deal brackets and plaster backings, with two enriched members.



or,

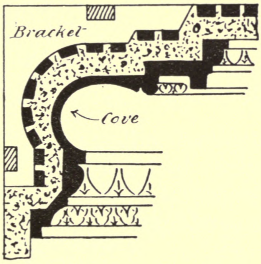


Run an enriched moulded plaster cornice to dining-room, drawing-room, breakfast-room and billiard-room (or other best rooms), 10 in. girth, on deal brackets and plaster backings, with two enriched members, and a frieze moulding 3 in. girth with one enrichment.

State if dentils, medallions or pateræ are required in the cornice to best rooms, with their modelling.

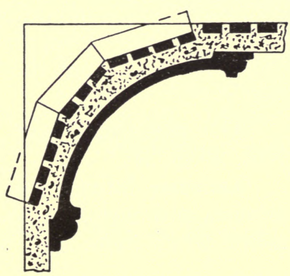
Coving.

(**32**)—Form a plain plaster cove 18 in. girth, with 2 in. deal bracket framing and fillets, lath with "lath-and-half" laths, plaster, float and set, and run two sets of enriched plaster mouldings, one 6 in. girth and one 4 in. girth, to the top and bottom of the coving, with two enrichments in each set.



The cove may be formed in gauged plaster or cement, as clauses Nos. 20 or 21.

State if the bracket framing is built up in pieces.



Hall, stairs and vestibule cornices. (**33**)—Run an enriched moulded plaster cornice 10 in. girth, with two enrichments, to vestibule, hall and main staircase, passages and landings, from ground to second floor, on brackets and plaster backings.

The sketch to clause No. 30 would be suitable, with two enriched members.

See notes under clause No. 31.

Lobby cornice. (**34**)—Run a plain moulded plaster cornice to principal entrance lobby, 6 in. girth, on plaster backings.

See sketch to clause No. 29.

Centre flowers. (**35**)—Allow the p.c. sum of £1. 5s. each for a centre flower to drawing-room, dining-room and breakfast-room, and £1 for one to entrance hall.

Ceiling ribs. (**36**)—Form plain plaster moulded ceiling ribs 4 in. girth to dining-room to design, with all intersections and mitres.

See sketches in Carpenter, clauses Nos. 209 and 208.

Then describe the cornice as any of the clauses Nos. 29 to 34 or 37.

Basement cornices. (**37**)—Run plain plaster moulded cornice 8 in. girth to kitchen, butler's pantry, housekeeper's room (or other servants' rooms) and servants' hall, on plaster backings.

See sketch to clause No. 29.

Ceiling roses. (**38**)—Form plain plaster moulded ceiling roses 8 in. (12 in., 15 in. or 18 in.) diameter to kitchen, butler's pantry, housekeeper's room, servants' hall (or other servants' rooms), round the gas pendants.

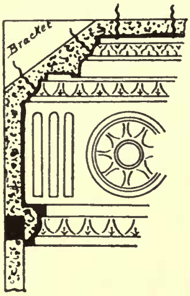
Skylight mouldings and fascias. (**39**)—Lath with "lath-and-half" laths, plaster, float and set the fascia linings to lantern light, with a plain moulding on ceiling, 3 in. girth, one necking moulding 2 in. girth, and a cornice moulding 6 in. girth. Form out the fascia in panels with mouldings $1\frac{1}{2}$ in. girth.

The plastering may be done in gauged stuff or cement, as clauses Nos. 20 or 21.

Lantern linings may be to almost any design. State clearly the labours and enrichments. Describe the ceilings and cornices to lantern soffits when there is no skylight but merely the vertical side lights.

Fibrous plaster, carton pierre or papier mache ceilings.

(**40**)—Prepare joists, fir up, and fix with galvanised screws (or zinc nails), an ornamented fibrous plaster ceiling to design to drawing-room, p.c. £1 per yard super., and fill up joints with plaster of Paris.



Run round room an ornamental fibrous plaster cornice with two enrichments, and an ornamental frieze and frieze moulding, p.c. 5s. per foot run complete, fixed to brackets and fillets plugged to walls.

Plaster to quartered partitions.

(**41**)—Lath with "lath-and-half" laths, plaster, float and set to all quartered partitions on all floors, filling in the backs behind the skirtings with rough plaster (gauged plaster or cement). Form all arris angles in Keene's cement on a backing of Portland cement.

State if "single" or "double" laths be required, see clause No. 6,

For special work, partitions may be plastered in gauged stuff or cement, as clauses Nos. 20 or 21.

See notes under clause No. 22, but plastering to partitions in one or two-coat work is only done in very inferior positions.

Walls to be papered should be "set" in pure lime putty.

Walls to be whitened (or coloured) should be "set" in lime putty with a little sand.

Walls to be painted should be "set" in plaster of Paris or other internal cement, such as Parian, Keene's, Martin's, or Robinson's.

Plastered partitions panelled out.

(**42**)—State if partitions are panelled out in plaster, giving the size of moulding and any enrichment.

Rough plaster in roof.

(**43**)—Lath with "single" laths, and plaster the quartered partitions on the roof side of attics.

Sound-resisting plastered quartered partitions.

(**44**)—See Carpenter, clause No. 137.
Then describe the plastering as clause No. 41.

Plaster to walls.

(**45**)—Rake out joints of brickwork, hack over walls to form key, render, float and set in plaster all brick walls and partitions on all floors, filling in the backs behind the skirtings with rough plaster (gauged plaster or cement). Form all arris angles in Keene's cement on a backing of Portland cement.

For special work, walls may be plastered in gauged stuff (or cement), as clauses Nos. 20 or 21.

Render one coat, is only used on walls in rough situations, such as at the back of skirtings and window backs, and may either be done in gauged plaster, as clause No. 20, or in ordinary plaster, as clause No. 8.

Render and set, is used on walls in inferior work, and not often scratched over as in lathed work. It may be done either in gauged plaster, as clause No. 20, or in ordinary plaster, as clause No. 8.

Render, float and set, is used on walls in all ordinary and good class work. It is not often scratched over as in lathed work, but the floating coat is broomed over. It may either be done in gauged plaster or cement, as clauses Nos. 20 or 21, or in ordinary plaster, as clause No. 8.

Plastered walls panelled out.

(46)—See clause No. 42.

Rough plaster in roof.

(47)—Render in plaster the walls in roof next attic rooms, as also to all flues and chimney breasts in roofs. See Bricklayer, clause No. 44.

Batten walls and plaster.

(48)—The external walls on all floors on the south and south-west side of building, to be battened out on the inner face with 2 in. (or $2\frac{1}{2}$ in.) $\times$ $\frac{5}{8}$ in. ($\frac{3}{4}$ in. to $1\frac{1}{2}$ in.) fir battens 12 in. apart, plugged to walls, and where against flues fixed with iron holdfasts.

Then describe the plastering as clause No. 45, but of course the brickwork would not require hacking over.

Battening to walls is mostly used against thin walls, or near the sea, to keep out the damp from entering the plastering. In hollow walls battening is not necessary.

Staff beads.

(49)—Run $1\frac{1}{4}$ diameter staff beads in Keene's cement, with splayed stops to archways and openings and to all similar positions, as also to angles of walls in passages.

Inside reveals, soffits and window boards.

(50)—Form the inside reveals, head linings, and internal sill linings to windows of plastered cellars, 1 in. thick in Portland cement and sand in equal proportions, finished a trowelled face, with the arris slightly taken off and keyed into the other work. (Also see Carpenter, notes to clause No. 144, as also for sketches.)

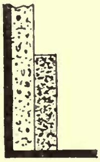
For external sills in cement, see clause No. 73.

Render internal walls in cement.

(51)—Rake out joints of brickwork, hack over walls to form a key, and render, float and set the walls of scullery 1 in. thick in Portland cement and sand in the proportion of 2 to 5, and finish a floated face.

Concrete ceilings and soffits to stairs may be finished in Portland cement in a similar manner.

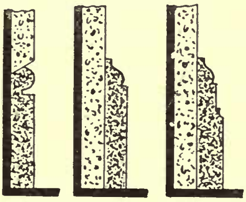
Cement skirting.



(**52**)—Run round walls of scullery, kitchen, larder, servants' w.c. (or other offices), and passages in basement, where against a cement or stone floor, a 7 in. × $\frac{3}{4}$ in. plain cement skirting, formed with Portland cement and sand in equal proportions.

Moulded cement skirting.

(**53**)—Sometimes certain rooms, halls and staircases have moulded cement skirtings. Describe as clause No. 52, giving size and labours, and mention the mitres, irregular mitres, stopped ends, ends on splay, returned and mitred ends and circular corners.



Cement backs to window backs.

(**54**)—Rough render $\frac{3}{4}$ in. thick in Portland cement and sand in the proportion of 2 to 5 the brickwork at back of deal window backs.

The brickwork behind the linings and shutters to windows may also be cemented or plastered over roughly, as also behind coil cases.

Old plaster or cement renewed.

(**55**)—Hack off old plaster (or cement) from brick walls in scullery, rake out joints of brickwork, render, float and set in plaster (gauged plaster or cement, as clauses Nos. 20 or 21, or in Portland cement, as clause No. 51).

Old plaster to ceilings or partitions renewed.

(**56**)—Hack off old plaster from ceilings and partitions in breakfast-room, remove decayed laths, relath, replaster, float and set in plaster (or gauged stuff or cement, as clauses Nos. 20 or 21).

Dubbing out.

(**57**)—Rake out joints of brickwork to irregular wall of passage in basement, dub out in plain tiles and cement to 3 in. thick; render, float and set in plaster (gauged plaster or cement, as clauses Nos. 20 or 21, or in Portland cement, as clause No. 51).

Dubbing out in tiles may be done to thicken walls, as thickening out in brickwork would take too much space, and if done in plaster would be too weak.

Pugging to floors.

(**58**)—See clause No. 46 in Carpenter.

Clauses Nos. 59 to 62 should come more properly under Painter; as also clauses Nos. 15 to 18, references to which will be found in Painter.

Whitening. (**59**)—Size and twice whiten all ceilings, cornices, coves and centre flowers to all rooms, passages, landings, halls and soffits on all floors.

See notes to clause No. 16. Ceilings and cornices may also be distempered; see clauses Nos. 60 and 18.

On old ceilings the description would run:—

Wash, stop and twice whiten ceilings, cornices, coves and centre flowers (state where), and cut out stains.

If the old ceilings have been papered, the description would run:—

Strip, wash, stop, line with stout elephant lining paper, cut down joints, size and twice whiten ceiling, coves, cornices and centre flowers (state where).

When ceilings are very bad, they are papered over with lining paper to hide the cracks when it would entail too much expense to cut them all out.

Distempering. (**60**)—Size, clearcole and distemper walls of kitchen, scullery, larder, passages and servants' w.c. (and similar positions).

See notes to clause No. 18.

Distempering on old walls would be similar to clause No. 59 in the preparation.

Colouring. (**61**)—Twice size and colour walls of areas and larder (and similar positions).

See notes to clause No. 17; and clause No. 95 under Bricklayer.

Colouring to old walls would be similar to clause No. 59 in the preparation.

Whitewashing (limewhiting). (**62**)—Twice limewhite (whitewash) ceilings, walls and roof timbers of boiler house, coal cellar, areas and sheds.

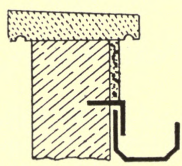
See notes to clause No. 15, and clauses Nos. 16, 93 and 94 in Bricklayer.

In old work the description would run:—

Brush down (or scrape off) old limewhite, wash and twice limewhite walls (state where).

See clause No. 94 under Bricklayer.

Parapet wall. (**63**)—Render the roof sides of parapet walls $\frac{3}{4}$ in. thick in Portland cement and sand in equal proportions.



Prevention against damp.

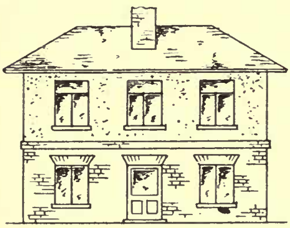
(**64**)—Render outside of walls of basement where ground abuts, 1 in. thick in Portland cement and sand in the proportion of 1 part cement to 2 parts sand, and finish in neat Portland cement $\frac{3}{8}$ in. thick, trowelled face.

Asphalt may be used (see Bricklayer, clause No. 43), or slates and cement may be used (see Slater, clause No. 14).

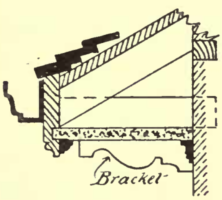
Portland cement mixed with sand will not prevent wet penetrating walls. A finishing coat of neat Portland cement only is reliable when there is continual damp against the walls, but with walls above ground wet may be prevented coming through by treating them as in clauses Nos. 68 to 70.

External lime stucco.

(**65**)—Rake out joints and hack over surfaces to form key to all external brick walls, sills, heads and reveals from first-floor level to roof, render, float and finish in lime stucco, trowelled face, and paint over four times in oil colour (or finish with felt floated face, size and twice colour).



Lath with "double laths," plaster, float and finish the eaves soffits (planceers) in a similar way, and paint as before (or colour).



Run two mouldings, each 3 in. girth, against walls and eaves boards.

See clause No. 19; also see Carpenter, clause No. 86.

State if eaves soffits are formed out in panels and if with cast plaster brackets.

Lime stucco between the bays of half timber work, as shown by the sketches in Carpenter, clause No. 333, would be similarly described.

External stucco is not necessarily painted or coloured.

If stucco is on timber studding, or timber and brick framing which is all flush, the description would run:—

Batten over the surfaces and reveals with 1 in. × 1 in. battens every 12 in. apart, lath with "double" laths, plaster, float and finish in lime stucco, trowelled (or felt floated) face, and paint four times in oil (or size and twice colour).

Then describe the eaves soffits, mouldings, panels or brackets.

External cement stucco.

Describe the position of the work, and continue on with render and set in Portland cement stucco, the setting coat to be mixed with washed sand. Paint four times in oil colour (or twice colour).

See clause No. 19.

Cement stucco between the bays of half timber work, as shown by the sketches in Carpenter, clause No. 333, would be similarly described.

If the stucco is on timber studding, or timber and brick framing which is all flush, the description would run:—

Batten over the surfaces and reveals with 1 in. × 1 in. battens every 12 in. apart, lath with "double" laths, render, float and set in Portland cement stucco, the setting coat to be mixed with washed sand and finished a trowelled (or felt floated) face, and painted four times in oil colour (or twice coloured).

External rough cast lime stucco.

(66)—Describe the position of the work as in clause No. 65, and go on with render and rough cast in lime stucco (and twice colour if required).

See clause No. 19.

Rough cast lime stucco between the bays of half timber work, as shown by the sketches in Carpenter, clause No. 333, would be similarly described.

If on timber studding, or timber and brick framing, all of which is flush, describe the battens as in clause No. 65, then lath with "double" laths, render and rough cast in lime stucco (and twice colour if required).

External rough cast cement stucco.

Describe the position of the work as in clause No. 65, and go on with render and rough cast in Portland cement stucco (and twice colour if required).

See clause No. 19.

Rough cast cement stucco between the bays of half timber work, as shown by the sketches in Carpenter, clause No. 333, would be similarly described.

If on timber studding, or timber and brick framing, all of which is flush, describe the battens as in clause No. 65, then lath with "double" laths, render and rough cast in Portland cement stucco (and twice colour if required).

Pebble dash.

(67)—Describe the position of the work as in clause No. 65, and go on:—

Render and float in lime stucco, and finish with pebble dash; the pebbles being not larger than $\frac{1}{2}$ in. (or $\frac{3}{4}$ in.) diameter.

See notes to clause No. 19. Pebble dash between the bays of half timber work, as shown by the sketches in Carpenter, clause No. 333, would be similarly described.

If on timber studding, or timber and brick framing, all of which is flush, describe the battens as in clause No. 65, then lath with "double" laths, plaster, and float in lime stucco, and finish with pebble dash, the pebbles being not larger than $\frac{1}{2}$ in. (or $\frac{3}{4}$ in.) diameter.

Plain cemented external walls.

(**68**)—Rake out joints, hack over face to form key, render and set 1 in. thick in Portland cement and sand, in the proportion of 1 part cement to 3 (or $2\frac{1}{2}$) parts sand, to the external walls of building, from 3 in. below ground line to roof level, form cement reveals and angles with sharp arrises. The window sills to be cemented over and throated.

This is practically the same class of work as cement stucco, mentioned under clause No. 65. State if painted.

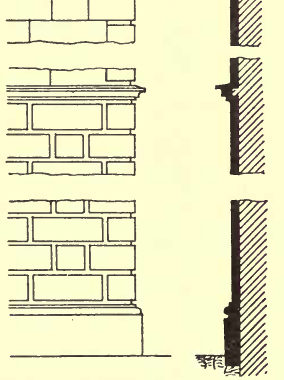
If on timber studding, or timber and brick framing, all of which is flush, state the work is to be battened out as in clause No. 65, then lathed, plastered, floated and set in cement.

Rough cement to outbuildings.

(**69**)—Render walls, reveals, and sills of outbuildings in Portland cement and sand in the proportion of 1 part cement to 3 parts sand.

Ashlar cemented walls with mouldings.

(**70**)—Rake out joints, hack over face to form key, render and set trowelled face (or felt floated face) in Portland cement and sand in the proportion of 1 part cement to 3 (or $2\frac{1}{2}$) parts sand to external walls of buildings from 3 in. below ground line to coping level, round the parapets and down to the roof gutters. The setting coat to have a little washed sand mixed with it. Line out in ashlar courses from first floor string to coping level. Dub out from 3 in. below ground line to first floor string course 1 in. extra thickness, and form blocks with channelled rustic grooves $\frac{3}{4}$ in. deep, $1\frac{1}{2}$ in. wide, with similar reveals and voussoirs to arches.



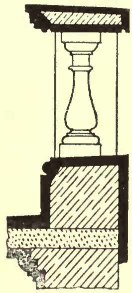
Dub out the angles of buildings from ground level to parapet with plain tiles and cement, and form similar rustic quoins standing out 1 in. beyond the rustic blocks on ground floor, and 2 in. beyond the plain ashlar blocks on first floor.

Dub out plinth in plain tiles to an 1 in. extra thickness beyond the rustic quoins on ground floor, and run the plinth moulding 2 in. girth in cement and sand in equal proportions.

Form the weathered, throated and moulded string course 8 in. girth, the moulded necking course 3 in. girth, the weathered, moulded, throated and sunk cornice 24 in. girth, and the weathered and twice throated coping with a moulding on front edge 4 in.

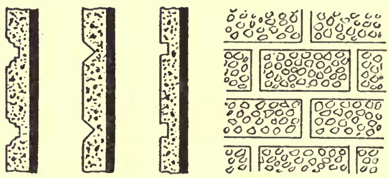
girth in Portland cement and sand in equal proportions. Form the moulded architraves 8 in. girth with plain reveals to first floor windows, and moulded, weathered and throated sills 4 in. girth to all windows on ground and first floor, in equal proportions of Portland cement and sand. Block out the main cornice with rough splayed York core (say) 2 ft. wide, 3 in. (or 4 in.) thick, in lengths of not less than 5 ft., with a brick core filling above and below. (See Mason, clause No. 33.)

Form out the string on first floor with brick core.



If instead of the plain cement parapet blocking a balustrade is required, then describe the cast cement moulded balusters with the diameter, height and distance apart, including the modelling. Also mention the moulded base, with the girth of the moulding, and the size of the dies and half balusters. Describe any cast ornaments to the frieze, including the modelling.

State if the rustic blocks and quoins are V-shaped or moulded instead of channelled, and if vermiculated.



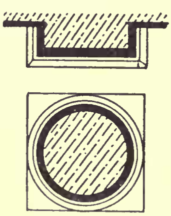
Molded V shaped Chanelled Vermiculated

The York stone core varies in size as to the projection of the main cornice, see Mason, clause No. 33.

If the cement-work is on timber studding, or timber and brick framing all of which is flush, state the work is to be battened out as in clause No. 65, then lathed, plastered, floated and set in cement. State if the work is painted.

Cemented columns or pilasters.

(71)—See Bricklayer, clause No. 38, for brick core, and go on :—

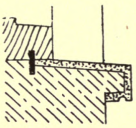


Render and set in Portland cement in the proportions of 1 part cement to 2 parts sand, the columns and pilasters to entrance porch, carefully form the flutings, mouldings, caps, bases and enrichments. The setting coat to have a little washed sand mixed with it. The entablature with the mouldings would be described similar to clause No. 70.

Portland cement wash on old work.

(72)—Hack off loose cement-work and re-cement. Scrape and wash down the face of old cement-work to buildings, cut out and stop up cracks, make good mouldings, arrises and enrichments in Portland cement and sand in equal proportions, and wash down twice in Portland cement-wash the whole of the work.

External cement sills to brick building.



(**73**)—Form sills in Portland cement and sand in equal proportions ¾ in. thick, trowelled face, with a deep throat on the under side, weathered on top, and with a brick core backing.

Cement sills are only done in very poor work.

Cement reveals and soffits ½ in. (to ¾ in.) thick are sometimes required to windows and doors of brick buildings, and painted over, with the arrises truly formed.

For internal sills and reveals in cement, see clause No. 50.

Cement floors and pavings.

(**74**)—Cement floors and pavings are often done by Plasterers. See Pavior, clauses Nos. 7, 8 and 9.

Cement hearths.

(**75**)—See Pavior, clause No. 5.

Tiling.

(**76**)—Tiling is often done by Plasterers. See Bricklayer, clauses Nos. 88 and 89a.

Plaster slabs.

(**77**)—When plastering to ceilings is required to be done very quickly, then ceiling slabs may be used. They are made from ½ in. to ¾ in. thick in plaster of Paris on canvas, in slabs 2 ft. 6 in. wide by 2 ft. 6 in. or 3 ft. 6 in. long, and nailed to the joists with 1½ in. nails; the work is then floated over and set in the usual manner with plaster.

GASFITTER.

Tubing. (**1**)—The pipes to be "black" (or galvanised) wrought-iron welded gas tubing, with all tees, bends, angles, crosses, nipples, unions, screwed joints, elbows, pipe brackets, reducing sockets, caps, plugs, wall hooks, clips, bands and other connections, the joints being made with red lead cement. The tubing to be concealed in the plaster and fixed to walls with wall hooks and to woodwork with iron bands. The tubing in the servants' bedrooms, kitchen offices and like situations to be secured on the face of the walls with patent clips.

For sketches of pipe fixings, see Plumber, clause No. 63.

All tubing to be laid to falls, so that any water accumulating can be drawn off from any part, a sufficient number of screwed caps or plugs being provided for this purpose.

Tubing exposed to view to be painted three coats in oil colour and decorated to match the other work, and where not exposed to view, such as under floors or where concealed in the plaster, is to be painted two coats. (See Painter, clause No. 49.)

For casings to gas pipes, see Carpenter, clause No. 41.

Floor boards covering up tubing to be fixed with brass cups and screws, with access traps. No floor joists or main timbers to be cut or bored through, except immediately against the walls, and then only $\frac{1}{2}$ in. down.

It is preferable to fix all gas tubing on the surface of walls and ceilings, so that the pipes can be seen, and the least escape of gas detected. It is usually done so in servants' offices and like situations; the tubing may be fixed either with wall hooks, iron bands or patent clips. The patent clips keep the tubing away from the walls, and allow the pipes being removed with ease. Gas tubing for best work should be galvanised in addition to painting.

When gas has to be laid on to an existing building, the tubing may be fixed surface work if desired in the best rooms, encased in wood casings similar to electric light casings.

Wrought-iron gas tubing is made in the following sizes and weights:—

			lbs.	oz.	
$\frac{1}{8}$ in. bore	weighs	about	0	13	per yard run.
$\frac{1}{4}$ in.	„	„	1	3	„
$\frac{3}{8}$ in.	„	„	1	13	„
$\frac{1}{2}$ in.	„	„	2	9	„
$\frac{3}{4}$ in.	„	„	3	8	„
1 in.	„	„	5	5	„
$1\frac{1}{4}$ in.	„	„	7	9	„
$1\frac{1}{2}$ in.	„	„	8	14	„
$1\frac{3}{4}$ in.	„	„	11	12	„
2 in.	„	„	13	7	„
$2\frac{1}{4}$ in.	„	„	15	15	„
$2\frac{1}{2}$ in.	„	„	20	0	„
$2\frac{3}{4}$ in.	„	„	25	3	„
3 in.	„	„	27	11	„

Composition tubing and block tin tubing are made in the following sizes and weights:—

$\frac{1}{4}$ in. bore composition tubing weighs about 13 oz., and block tin weighs about 8 oz. per yard run.

$\frac{5}{16}$ in. bore composition tubing weighs about 16 oz., and block tin weighs about $9\frac{1}{2}$ oz. per yard run.

$\frac{3}{8}$ in. bore composition tubing weighs about 21 oz., and block tin weighs about 11 oz. per yard run.

$\frac{7}{16}$ in. bore composition tubing weighs about 26 oz., and block tin weighs about 14 oz. per yard run.

$\frac{1}{2}$ in. bore composition tubing weighs about 34 oz., and block tin weighs about 17 oz. per yard run.

$\frac{5}{8}$ in. bore composition tubing weighs about 52 oz., and block tin weighs about 23 oz. per yard run.

$\frac{3}{4}$ in. bore composition tubing weighs about 68 oz., and block tin weighs about 30 oz. per yard run.

$\frac{7}{8}$ in. bore composition tubing weighs about 76 oz., and block tin weighs about 38 oz. per yard run.

1 in. bore composition tubing weighs about 88 oz., and block tin weighs about 47 oz. per yard run.

India-rubber gas tubing and flexible glazed tubing are made in $\frac{1}{4}$ in., $\frac{3}{8}$ in., $\frac{7}{16}$ in., $\frac{1}{2}$ in., $\frac{5}{8}$ in. and $\frac{3}{4}$ in. internal diameters, and are used for attaching to gas burners for supplying table reading lamps.

Composition tubing is used in inferior work. Block tin tubing is seldom used for gas, and copper tubing is not suitable.

Bore is the clear internal diameter.

To pass Gas Company's inspector's examination.

(2)—The gasfitting is to be executed to the satisfaction of the Gas Company's inspector. Give the Company notice and pay their fees for connecting with their main. Make good all pavements, roads, kerbs and channelling disturbed, to the satisfaction of the local authorities.

Test gas. (3)—Before covering up the tubing, the whole system is to be tested by hydraulic pressure in the presence of the architect to five times the pressure in the Company's mains, and any defects found are to be remedied.

Cut away and make good. (4)—Cut all holes and chasings and make good.

The following sizes of gas tubing may be taken roughly as of sufficient capacity for supplying the number of jets mentioned below:—

Tubing	$\frac{1}{4}$ in.	bore will supply up to .	3	gas jets.
„	$\frac{3}{8}$ in.	„ „ .	4 or 6	„
„	$\frac{1}{2}$ in.	„ „ .	10 or 12	„
„	$\frac{5}{8}$ in.	„ „ .	16	„
„	$\frac{3}{4}$ in.	„ „ .	25	„
„	1 in.	„ „ .	45 or 50	„
„	$1\frac{1}{4}$ in.	„ „ .	65 or 70	„
„	$1\frac{1}{2}$ in.	„ „ .	100 or 120	„
„	$1\frac{3}{4}$ in.	„ „ .	140	„
„	2 in.	„ „ .	180 or 200	„

But in practice gas tubing from $\frac{1}{2}$ in. bore and upwards often has to accommodate many more lights than the numbers mentioned.

An allowance of 4 cubic ft. of gas per hour should be made for internal lights, and 5 cubic ft. for external lights. An Argand burner requires from 6 to 10 cubic ft. per hour.

There are two ways of supplying a building with gas:—

"First," and the usual method:—

By taking the largest pipe from the meter to the lowermost floor and diminishing the pipe as it ascends to each upper floor; the lower floors having generally to supply the largest number of jets, must also be of a capacity to allow sufficient gas to pass onwards to the upper floors.

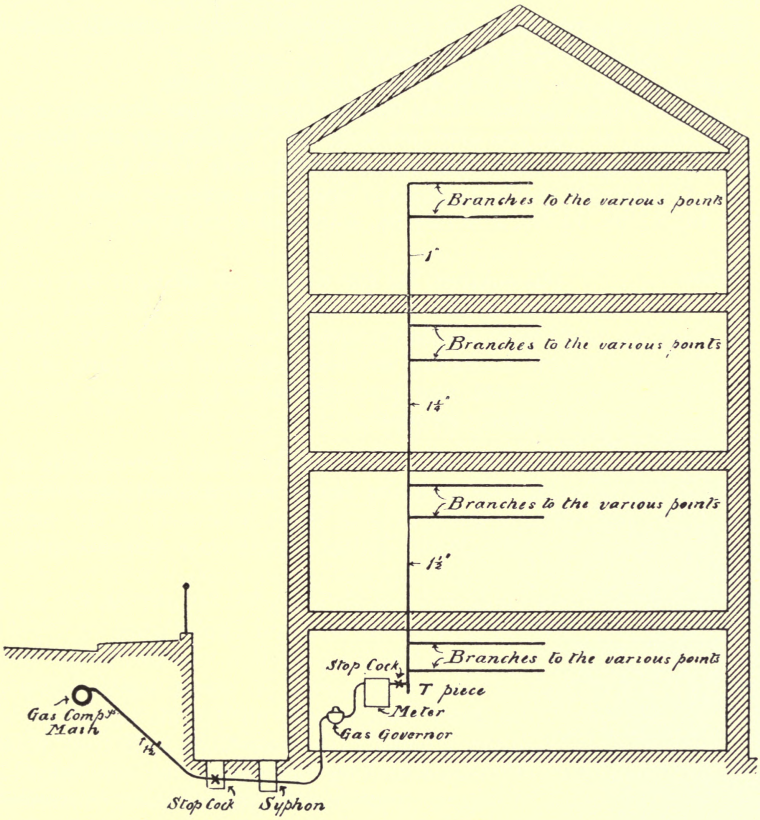
"Secondly," or the unusual method:—

The largest pipe is taken to the top of the building and run round in the roof the full bore, with several separate pipes brought down from separate points off the main in the roof to each floor below, diminishing on each floor as they descend.

Thus, in this case the pipes must be brought down sufficiently large to supply the lower floors, where the greater amount of work is required.

It is only in very special cases that this method of distributing gas would apply, and will not therefore be further referred to.

The following description is an example case for supplying a building with, say, 110 lights by the first-mentioned or the usual method:—



Connection with Gas Company's main.

(5)—Open up ground in road and connect to Gas Company's main with 1½ in. screw ferrule, and take 1½ in. wrought-iron welded gas tubing to building, buried 2 ft. down in the ground in an 1 in. rough deal tarred trough filled with pitch, with an 1½ in. full-way brass stop-cock and spanner fixed in an iron chamber in ground and bedded round in concrete, having an

Stop-cock. Syphon.

attached enamelled iron label marked "Gas Stop-Cock to Syphon." Continue the 1½ in. pipe to a 1 quart syphon box, fixed in ground and bedded round in concrete, and provided with an attached enamelled iron label marked "Gas Syphon." Take the 1½ in. pipe on to an 1½ in.

Gas governor.

patent self-acting gas governor, with lock and key, and labelled "Gas Governor," and connect to meter with heavy lead pipe and brass connections.

This stop-cock in the ground is for shutting off the gas from the Gas Company's mains when attending to the syphon.

Syphon boxes are only required when the service pipe from the Gas Company's main descends towards the building, so as to collect any condensed liquids that may find their way down from the Gas Company's mains.

When the supply from the Gas Company's mains ascends towards a building, a syphon box is unnecessary.

Syphon boxes are made in 1, 2, 3 and 4 quart sizes.

A gas governor regulates the pressure from the Gas Company's mains into the meter, so that gas may not force its way through the meter and be wasted through the burners, as is often the case when the pressure of the Gas Company's mains is great. Gas governors are made for $\frac{1}{2}$ in., $\frac{3}{4}$ in., 1 in., $1\frac{1}{4}$ in., $1\frac{1}{2}$ in., 2 in., $2\frac{1}{2}$ in., 3 in. and 4 in. pipes.

Meter. **(6)**—Allow for the hire of an 80-light dry (or wet) gas meter, and fix on an $1\frac{1}{4}$ in. wrought deal rounded shelf with brackets, and encase with $\frac{3}{4}$ in. wrought deal beaded matching and bearers, with door hung on $1\frac{1}{2}$ in. brass butts, and provided with $1\frac{1}{2}$ in. brass knob and turn-buckle on plate.

In deciding the capacity of a meter, only about five-eighths of the number of lights required should be taken into account, as meters are capable of supplying more gas jets than those indicated on the meter as its nominal capacity. Thus 110 lights would only require about an 80-light meter.

Dry gas meters are made for 1, 2, 3, 5, 10, 20, 30, 40, 50, 60, 80, 100, 150, 200, 250, 300, 400, 500, 600, 700, 800 and 1000 lights.

Vertical main. **(7)**—Connect to outgo of meter with heavy lead pipe and brass connection, an $1\frac{1}{2}$ in. brass stop-cock and spanner labelled "Gas Stop-Cock to House," with an $1\frac{1}{2}$ in. **T** piece 3 in. long and screw plug, and take $1\frac{1}{2}$ in. main tubing up to ceiling of ground floor, continued on with $1\frac{1}{4}$ in. tubing to ceiling of first floor, and 1 in. tubing to ceiling of second floor.

This **T** piece will collect any condensed liquids that may form in the house tubing, and can be cleaned out periodically by unscrewing the plug. This second stop-cock is not absolutely essential.

Branch pipes. **(8)**—Branch off from the various vertical mains separate pipes to the following positions:—

$\frac{1}{2}$ in. tubing to 20 positions in basement.
$\frac{1}{2}$ in. „ to 30 „ on ground floor.
$\frac{1}{2}$ in. „ to 20 „ on first floor.
$\frac{1}{2}$ in. „ to 20 „ on second floor.
$\frac{1}{2}$ in. „ to 4 „ on staircase, and finish with brackets, p.c. 12s. each.

$\frac{1}{2}$ in. tubing to 2 positions to newel tops in hall, and finish with newel lamps, p.c. 30s. each.

$\frac{1}{2}$ in. tubing to 1 position in hall, and finish with hall lamp, p.c. £3, with a 10 in. glass bell consumer above with brass chain and rose.

1 in. tubing to 1 position in billiard-room, and finish with a six-arm fitting, p.c. £3.

$\frac{3}{8}$ in. tubing to 1 position in smoking-room, and finish with a pipe jet and stop-cock.

1 in. tubing to 1 position for hot-plate in kitchen, with stop-cock (see Smith, clause No. 98).

$\frac{1}{2}$ in. tubing to 2 positions to geysers in bath rooms, with stop-cocks, and allow the p.c. sum of £7 for each géyser.

$\frac{3}{4}$ in. tubing to 4 positions to gas stoves, with stop-cocks, and allow the p.c. sum of £6 for each stove (see Smith, clause No. 88).

$\frac{3}{4}$ in. tubing to 2 positions for gate lamps, and allow the p.c. sum of £5 for each lamp.

$\frac{3}{4}$ in. tubing to 1 position for Sun burner, with bye-pass tap and regulator and stop-cock, and allow the p.c. sum of £12 for Sun burner.

$\frac{3}{4}$ in. tubing to 1 position for gas oven in kitchen, with stop-cock (see Smith, clause No. 99).

In setting the positions of gas points do not omit the w.c.'s and bath-rooms.

Of course the branch pipes need not necessarily all be taken separately off the vertical main passing through the rooms, so long as they are taken from horizontal branches off the vertical main of sufficient capacity to allow of the branch pipes to the various points being taken off the horizontal branches. Tubing $\frac{1}{4}$ in. and $\frac{3}{8}$ in. bore will suffice for many of the positions given.

Glass bell consumers may be placed in any position over fixed gas jets, where the jet is too near a ceiling.

Jets should not be fixed nearer a ceiling than 3 ft., but at a sufficient height to allow people to pass under.

Sun burners are made for	9	15	20	27	44	63 and 81 jets.
With diameters of	15	20	24	29	31	34 and 42 in.

They are mostly used for lighting public buildings and the principal staircases of private houses. Owing to the volume of gas burnt, a considerable amount of heat is generated, which will cause an excellent updraught and assist the ventilation; but a large exhaust tube should be taken from the top of Sun burners out into the open air, with an access door. Also see the notes upon gas under "Ventilation."

The Wenham and Meteor gas lamps are enclosed in a glass globe, and used for lighting public buildings and shops. They are a species of small Sun burner, and require a ventilating tube as well as a bye-pass tap and regulator. They are made in sizes to consume 6, 9, 12, 15, 20 and 23 cub. ft. of gas per hour.

If a gas engine be required for any purpose, extra provision must be made in the size of the pipe taken from the Company's main.

Gas may be required to assist in creating an updraught in a flue or ventilator in the ceiling; $\frac{3}{8}$ in. to $\frac{1}{2}$ in. pipes are usually large enough.

Gas points in stables should be supplied with fixed brackets, and a nozzle at some point for attaching a rubber tube for singeing the horses. Yard lamps are also required.

In a kitchen (and sometimes in other rooms with skylights over) the gas tubing must be run across the light and under the blind, see the sketch on page 182.

Pendants.

(9)—Put to kitchen a strong 2-light iron pendant, p.c. £1. 5s., secured to bearers fixed to joists, with brass universal joint, patent burners, and 7 in. opaque moons.

Brackets.

(10)—Put to office a double-jointed bronzed gas bracket, p.c. 15s., with rose plate, mahogany block, patent burner, and 7 in. opaque moon.

Fittings.

(11)—Allow the sum of, say, £80 for gas brackets, chandeliers and other fittings.

The gas fittings are not often included in a contract. Brackets are made "stiff," with arms either 6 in., 8 in. or 9 in. long; "single swing," with an arm 12 in. long; "double swing," with two arms each 12 in. long. Pendants are made either to swing, to slide or stiff, and for one light or more.

Library and studio.

(12)—Allow for two 10 ft. lengths of india-rubber tubing, with screw unions at either end for attaching to gas burners and reading lamps.

Private carriage drive lamp posts.

(13)—Allow a p.c. sum, and take laying on the gas to them.

BELLHANGER.

Wire Bells.

(Clauses Nos. 1 to 6 and 11.)

Wire bells generally. (**1**)—Hang bells with No. 16 gauge stretched copper wire concealed in walls in stout zinc (brass, galvanised iron, or copper) tubing, and supplied and mounted with brass cranks, carriages, steel springs, copper wire check springs and bell board runners. The flooring over bell wiring is to be made movable, and fixed with screws.

The bells to be 3 in. ($3\frac{1}{2}$ in. or 4 in.), of good tone, each bell giving a different sound, with an average weight of 14 oz. (to 2 lbs.) each, and provided with brass pendulum indicators and springs. The metal to be composed of 1 part pure tin to 3 (or 4) parts of copper.

Nos. 16 to 19 B.W.G. copper wire is used for bell wiring.

Bell board. (**2**)—The bell board to be 11 in. $\times$ $1\frac{1}{4}$ in. (or 1 in.) wrought beaded and rounded deal, screwed to plugs in wall, with the names of the various rooms marked on.

See Painter, clause No. 48.

Room bells. (**3**)—Hang a wire bell to ring from each ground-floor room to bell board, with lever bell pulls, p.c. 5s. each; and from each first and second floor room with stranded silk cords and tassels near the beds; and with plain cords and tassels to third-floor bedrooms.

Give any other position required.
Bell levers may be in brass, china, glass or wood.

W.C. bells. (**4**)—Hang similar wire bells from each w.c. to bell board, with lever bell pulls, p.c. 3s. each.

Call bells. (**5**)—Hang similar separate wire call bells from ground to top floor; first floor to top floor; and top floor to ground floor, with lever bell pulls, p.c. 3s. each, and with the positions to which they ring written on the walls.

Entrance door bell. (**6**)—Hang a similar wire bell to ring from front door to bell board, with bronzed sunk bell pull, p.c. 8s.; and from tradesmen's entrance with sunk bell pull, p.c. 5s.

Sunk bell-pull plates are made 5 in. × 5 in., 5½ in. × 5½ in., 6 in. × 6 in., 6½ in. × 6½ in., 8½ in. × 3 in., 13 in. × 5 in.; and in 3½ in., 4 in. and 4½ in. diameters.

Outside bell pulls may have long slide pulls, or chains and handles in iron, brass or gun-metal.

Fire bell. (**7**)—Allow the p.c. sum of (say) £10 for a fire bell, with brackets and rope pull.

Church or school bells. (**8**)—Allow a p.c. sum.

Electric bells generally. (**9**)—The wire to be tinned copper covered with india-rubber and cotton, concealed in the walls in stout zinc (or copper) tubing. Where in ground the wires are to be covered with gutta-percha and tarred tape, and laid in a deal trough filled with pitch. Provide a battery with porous pots, and an indicator box in mahogany with glazed tell-tale front, with the name of each position marked on.

All ground-floor rooms to have press buttons, p.c. 2s. 6d. each, and bedrooms to have stranded silk-covered wire with push tassels.

Press buttons are made in china, glass, brass and wood. Give the number and position of bells required, as in clauses Nos. 3 to 6.

State if any bell is to have a continuous action, such as is used in shops.

Pneumatic bells. (**10**)—Compressed air is employed through very small tubes. All the fittings are very similar to Electric Bells.

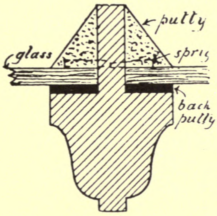
Give the positions, as in clauses Nos. 3 to 6.

Repairs to bells (wire or electric). (**11**)—Test all bell wires, strain up and repair with No. 16 gauge copper wire, adjust all bells, cranks, levers, pulls, runners, blocks, boxes, springs and pendulums; put new where defective or missing; black all bells and relacquer the brasswork to pulls and pendulums.

Test electric bells and fittings, and put in working order and recharge batteries.

GLAZIER.

Generally.



(1)—The glass to be the best quality of its kind, free from bubbles, smoke wanes, air holes, scratches and other defects, and cut to fit the rebates, with due allowance made for expansion, and carefully bedded in putty, back puttied, and sprigged (or pinned) where required with stout copper (or iron) sprigs.

Vertical glazing to be glazed perpendicular.

The British polished plate to be "Best quality," $\frac{1}{4}$ in. thick, "full" (or "bare"), and bedded in putty and wash-leather (or vulcanised india-rubber).

The British sheet to be second (or best) quality.

The rolled plate to be carefully selected.

$\frac{1}{2}$ in. glaziers' sprigs weigh about $\frac{1}{4}$ lb. per 1000.
$\frac{3}{4}$ in. " " 1 lb. " "

Clean glass.

(2)—Clean all glass at completion inside and out.

Templates.

(3)—Supply all templates for lead glazing, circular sweeps, or irregular shapes.

Sheet glass (also called British sheet) is specified by the weight in ounces per superficial foot; it is made in six qualities—A, B, Best, Seconds, Thirds and Fourths, of the following weights:—

15 oz. per ft. super. (generally weighs about 16 oz.) and measures about $\frac{1}{15}$ in. to $\frac{1}{12}$ in. thick.

21 oz. per ft. super. measures about $\frac{1}{16}$ in. thick.
26 oz. " " $\frac{1}{9}$ "
32 oz. " " $\frac{1}{7}$ "
36 oz. " " $\frac{1}{6}$ "
42 oz. " " $\frac{1}{5}$ "

15 and 21 oz. are used for ordinary glazing.
26 and 32 oz. are used for a better class of glazing.
36 and 42 oz. are used for the best class of glazing.
A and B qualities are only used for pictures.
Best, Seconds and Thirds qualities are used for ordinary glazing, according to the class of building.
Fourths are seldom used, except in most inferior work.

Coloured and stained sheet glass is made in 16, 21, 26 and 32 oz. per ft. super., the glass being coloured throughout.

Flashed coloured sheet is made in 16, 21, 26 and 32 oz. per ft. super., one side of the glass only being coated with a thin film of coloured glass.

Ground (or obscured) sheet glass is sheet glass ground on one side, and is made in 15, 21, 26, 32, 36 and 42 oz. per ft. super ; it is suitable in positions where privacy is required.

Enamelled and embossed sheet glass is made in 15, 21 and 26 oz. per ft. super., and is similar to ground glass, but ground in the form of a pattern. It may be in colours.

Fluted sheet glass (also called English fluted sheet) is of a wavy section, and slightly obscured in transparency; it is made in the following weights, 15, 21, 26 and 32 oz. per ft. super., and is suitable for any position where a small amount of privacy is required.

"Patent plate" glass is sheet glass polished on both sides, and is made in the "Usual" and "Extra white" colours (both being white) in, three qualities—Best, Seconds and Thirds, and specified by the following numbers:—

No. 1, measuring about $\frac{1}{16}$ in. thick, and weighing about 13 oz. per ft. super.

No. 2, measuring about $\frac{1}{12}$ in. thick, and weighing about 17 oz. per ft. super.

No. 3, measuring about $\frac{1}{10}$ in. thick, and weighing about 21 oz. per ft. super.

No. 4, measuring about $\frac{1}{8}$ in. to $\frac{1}{9}$ in. thick, and weighing about 24 oz. per ft. super.

It is suitable for glazing the best class of pictures, engravings and show cases, but seldom used for ordinary glazing in buildings.

In buildings, the "Usual" colour is suitable; and for pictures and engravings the "Extra white."

Crown glass is made in six qualities, A, B, Best, Seconds, Thirds and Fourths, and in two thicknesses:—

$\frac{1}{20}$ in., weighing about 10 oz. per super. foot.
$\frac{1}{15}$ " " 16 to 18 oz. "

A and B are picture qualities.

Best, Seconds and Thirds are ordinary glazing qualities.

Fourths are used in small cottages.

Crown glass is slightly clearer than sheet.

The largest sheet of crown glass obtainable is about 33 in. × 25 in., but crown glass is now almost entirely superseded by sheet glass.

British plate glass may be either "rough" or "polished," such as:—

Rough cast plate.
Rough rolled plate, either plain pattern, diamond, or quarry pattern.
Polished plate.

The rough cast plate is somewhat obscured, and is made $\frac{1}{4}$, $\frac{3}{8}$, $\frac{1}{2}$, $\frac{3}{4}$ and 1 in. in thickness, and is suitable for pavement lights, skylights and roof lights.

The rough rolled plate (often called Hartley's rolled plate) is also somewhat obscured, and having a series of small flutes on one side, either in very fine lines near together, or with 4 or 11 flutes to the inch run; it is only made in one quality, in $\frac{1}{8}$ in., $\frac{3}{16}$ in., $\frac{1}{4}$ in., and $\frac{3}{8}$ in. thicknesses, and is mostly used for top lights of lanterns, greenhouses and in roofs where too much light is not required.

Diamond or quarry rough rolled plate is similar to rough rolled plate, but having the flutes rolled in diamond or lozenge shaped patterns. It is made $\frac{1}{8}$ in., $\frac{3}{16}$ in., and $\frac{1}{4}$ in. thick, and is mostly used in vertical glazing where privacy and strength are required, such as in public halls and offices.

The British polished plate glass is polished both sides, and perfectly transparent. It is made in three qualitites only, "Ordinary," "Best" and "Silvering," and can be obtained $\frac{1}{8}$ in., $\frac{3}{16}$ in., $\frac{1}{4}$ in., $\frac{3}{8}$ in., $\frac{1}{2}$ in., $\frac{5}{8}$ in., $\frac{3}{4}$ in., $\frac{7}{8}$ in. and 1 in. thick; the $\frac{1}{4}$ in. "full" (or "bare") being mostly used for glazing purposes, and either the $\frac{1}{4}$ in. or $\frac{3}{8}$ in. for silvering. It is suitable for the best class of buildings and large shop fronts. Shelves in shop fronts may be $\frac{1}{4}$ in. to $\frac{3}{8}$ in. thick, but the edge must be ground and polished, either on one or both edges, or all round. If polished plate is bevelled on edges, state size of bevel, such as $\frac{1}{2}$ in., $\frac{5}{8}$ in., $\frac{3}{4}$ in., $\frac{7}{8}$ in., 1 in., $1\frac{1}{4}$ in. or $1\frac{1}{2}$ in. Bevelling is chiefly used for looking-glasses, screens, special doors and such like.

Plate glass is very strong, and keeps out cold and heat better than any other description of glass.

Cathedral glass is rolled plate about $\frac{1}{8}$ in. thick, or 26 oz. per foot super.; it is slightly obscured, and may be either white or in tints of no positive colour. It is mostly used in churches and schoolrooms.

There are many other forms of glass in the market, many of which are slightly obscured, either white or coloured, such as hammered plate, muffled plate, muranese plate, or rippled plate.

Polished British plate is the most transparent of all glass. Sheet glass is next in transparency. Rough cast is only about one-half to one-third as transparent as British polished plate. Rolled plate is only about one-fourth as transparent as British polished plate.

Common glass intercepts about 10 per cent. of light, ground glass about 25 per cent., and opal from 40 to 50 per cent.

Glass slates are made in plain rough plate, $\frac{1}{8}$ in., $\frac{3}{16}$ in., $\frac{1}{4}$ in., $\frac{3}{8}$ in. and $\frac{1}{2}$ in. thick; and in sheet glass, 16, 21, 26 and 32 oz. per foot super.

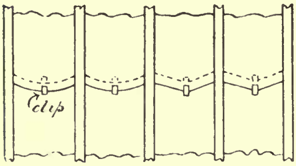
Glass tiles are made in rolled rough plate, either plain or fluted, $\frac{1}{8}$ in., $\frac{3}{16}$ in., $\frac{1}{4}$ in., $\frac{3}{8}$ in. and $\frac{1}{2}$ in. thick; and in sheet glass 16, 21, 26 and 32 oz. per foot super.

They are both made in the usual sizes of ordinary slates and tiles, and are fixed with copper nails, brass screws or oak pegs.

Glass, in any position subject to jars, should be bedded in wash-leather.

Lanterns and skylights.

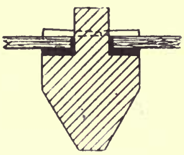
(4)—Glaze the top lights to lantern and skylights with $\frac{1}{8}$ in. ($\frac{3}{16}$ in. or other thickness) rolled close ribbed plate, back puttied and sprigged with copper (or iron). The sheets to lap at joints $\frac{1}{2}$ in., and be cut a segmental (or diamond) shape, and clipped together with $\frac{1}{2}$ in. (or $\frac{3}{8}$ in.) copper (or zinc) clips (tingles). The vertical sashes to be glazed with 21 oz. fluted sheet, bedded in putty, and sprigged with $\frac{1}{2}$ in. copper sprigs.



For sketches of skylights and lanterns, see Carpenter, clauses Nos. 124, 127, 129 to 131, and 133 to 134a.

If the skylights be glazed with clear sheet glass, it is always well to glaze the eave portions with close ribbed plate, on account of icicles clinging to the glass during frosty weather.

It is very usual now to glaze the top lights of skylights and lanterns by only bedding the glass on putty, flush with the upper surface of the glass, and then afterwards painting the glass to the framework, as the less putty is used in toplights the better.



Cutting the laps segmental or diamond shape, leads the water down the centre of the squares.

The vertical lights to lanterns are often glazed with leaded glass.

Ground and first floor windows.

(5)—Glaze the ground and first floor windows, with $\frac{1}{4}$ in. "full" British polished plate, bedded in putty and washleather, and sprigged. The servants' offices on this floor to be glazed with 21 oz. sheet glass in putty and sprigged.

Basement, second floor and attic windows.

(6)—Glaze all the windows on these floors with 21 oz. sheet in putty and sprigged.

W.C.'s and bath.

(7)—Glaze bottom sashes of w.c.'s and bath-room with 21 oz. fluted sheet in putty and sprigged.

Also see Painter, clause No. 39.

W.C.'s may be glazed in any form of obscured glass, or in leaded lights.

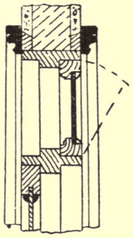
Doors.

(8)—Glaze the upper panels of (say) six of the basement doors with 21 oz. fluted sheet bedded in washleather and putty.

Close ribbed rolled plate is also used in these positions, it is stronger but more obscure. Washleather or vulcanised india-rubber deadens the concussion when slamming doors.

Fanlights over bedroom doors, second floor.

(9)—Glaze the fanlights over (say) eight of the second floor bedroom doors with 21 oz. fluted sheet, puttied and sprigged.



In dark passages the light thus obtained may be an acquisition, see Carpenter, clause No. 247.

Entrance hall screen.

(10)—Glaze the upper panels and fanlights to screen in hall in 16 oz. muffled sheet glass in five tints to sketch, in $\frac{3}{16}$ in. ($\frac{3}{8}$ in. to $\frac{1}{2}$ in.) lead cames, bedded in putty (or washleather) and sprigged, and secured to framing with $\frac{3}{16}$ in. iron saddle bars 18 in. apart, copper banded.

For sketch, see Carpenter, clause No. 235.

State if a design be painted on the coloured glass.

Leaded lights in positions subject to concussion often bulge if the saddle bars are too far apart. It is also a good plan to glaze them at the back in addition with some clear glass, such as sheet or plate.

Lead cames are made in various sizes from $\frac{3}{16}$ in. to $\frac{1}{2}$ in. wide, with grooves for the glass from $\frac{3}{32}$ in. to $\frac{1}{4}$ in.; the cames are either flat or rounded on the face in these sections . Fretwork is similar to leaded light glazing, but the name applies more especially to leaded work in designs of figured subjects, which, of course, are hand painted.

If no design be given, state the pattern and number of lines in the border, with their width and colours.

If leaded lights be fixed in stone grooves, they must be run in with mastic.

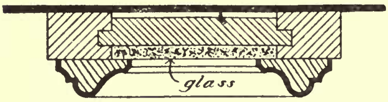
Shop front.

(11)—Glaze the shop front with $\frac{1}{4}$ in. "full" British polished plate, seated and bedded in putty and wash-leather (or vulcanised india-rubber), and sprigged with copper sprigs. The small squares at top to be glazed with 16 oz. muffled tinted sheets in $\frac{3}{8}$ in. leaded cames, bedded in putty and sprigged.

For sketches see Carpenter, clause No. 315.

State if there be any circular bent glass to the shop front at the angle.

Looking-glasses. (12)—Each of the (say) three wall spaces between windows in front room first floor to be covered over with a sheet of $\frac{1}{4}$ in. (or $\frac{3}{8}$ in.) British polished silvered plate glass, "Silvering" quality, secured to a 3 in. × 2 in. rebated deal frame with $\frac{3}{4}$ in. square framed deal back, rebated and grooved together and secured to wall with brass screws and eyes, and finished with a 2 in. × $1\frac{1}{2}$ in. deal and compo moulded beading round, double English gilt.



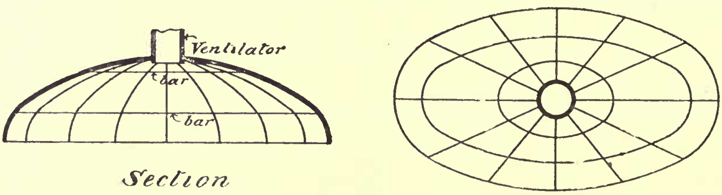
State if the glass is to be bevelled all round, with the size of the bevel, see notes to clause No. 3.

Iron lights. (13)—Glazing to iron sashes or lights is done in precisely the same manner as to deal, but care must be taken to well bed the glass in putty, and instead of sprigs screws are used to keep the glass in place.

Also see Smith, clauses Nos. 69 and 70.

Painted glass. (14)—A p.c. amount is usually allowed for hand-painted glass, see notes to clause No. 10.

Internal elliptical-shaped dome light. (15)—Glaze the internal dome light over principal staircase with clear 16 oz. muffled sheet glass, bent both on plan and section, and bedded in putty, with a rim of

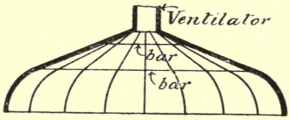


Section

coloured muffled sheet near the apex. Four of the lowermost squares are to be bedded loose, but secured. (For Painting, see Smith, clause No. 69.)

Bedding four or more squares loose enables their easy removal, so that planks may be put across the span of dome for cleaning the glass on the under side, should it be inaccessible from the staircase.

A cheaper way than employing double bent glass, is to form the dome in angular sections on plan instead of to a curve, and at a fair height up



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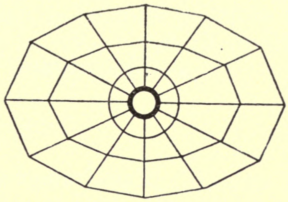
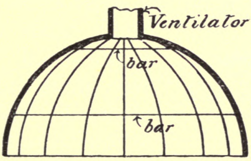


the angular shape is almost imperceptible. By so doing it only requires the glass to be bent in section; the description in this case would run as follows:—

> Glaze the dome light over principal staircase with clear 16 oz. muffled sheet bedded in putty, with a rim of coloured muffled sheet near the apex. The lowermost squares are to be in bent glass on section only four of which are to be bedded loose, but secured. The remainder of the glazing to be straight.

In a spherical dome all the glass has to be bent both ways. The glass may be bent in section only if the horizontal bars are straight



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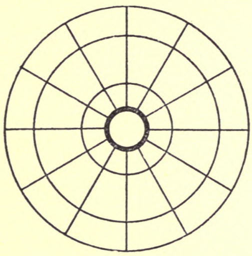


instead of circular, but the appearance would be distinctly bad when looking up.

Patent zinc and lead glazing bars. (**16**)—There are many systems in use. It will be better to obtain an estimate for this description of glazing from the particular manufacturer selected, and put the amount in as a p.c. sum; and then describe the kind of glass.

Zinc bar glazing is mostly used for top lights, stations and conservatories.

Glass ventilators. (**17**)—The two top windows of office are to have patent circular hit-and-miss glass ventilators 10 in. diameter, in 26 (or 32) oz. sheet (or $\frac{1}{4}$ in. plate) glass.

or,

Patent louvre ventilators, 15 in. × 12 in., in brass frames and levers and $\frac{1}{4}$ in. British plate louvres.

or,

Zinc frames, brass levers and patent plate louvres.

or,

Zinc frames and levers and 26 oz. sheet glass louvres.

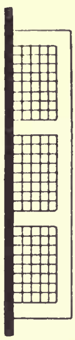
Patent louvre ventilators are made 6 in., 9 in., 12 in., 15 in., 21 in., 24 in. and 30 in. × 12 in.; also 18 in., 24 in. and 30 in. × 18 in., and 24 in. and 30 in. × 24 in.

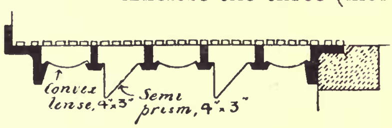
Patent circular glass ventilators are made for $3\frac{1}{2}$ in. to 10 in. diameters in 26 and 32 oz. sheet and $\frac{1}{4}$ in. polished plate, and are sold with the square of glass itself.

Patent louvre venetian ventilators are made in 1st, 2nd and 3rd qualities, 6 in., 12 in., 18 in., 24 in. and 30 in. × 12 in.; also 15 in., 24 in. and 30 in. × 18 in., and 30 in. and 36 in. × 24 in.

Pavement lights to areas or cellars.

(18)—Either allow a p.c. sum for pavement lights, or describe them thus:—





Enclose the three (more or less) areas at pavement level with patent semi-prism and convex lens pavement lights, fixed in alternate lines in cement to an iron frame, let into the wall on the one edge and rebated in on the other edges to a 9 in. × 5 in. (or 6 in.) tooled (or rubbed) hard York kerb in lengths of not less than 6 ft., rebated out for lights, set and jointed in cement, dowelled at joints, and ends let 6 in. into wall. Paint the ironwork four times in oil colour.

State if part of the lights are ventilated.

Pavement lights may also be glazed with plain rough cast plate $\frac{1}{2}$ in. to 1 in. thicknesses.

When pavement lights finish against woodwork, such as the stall-board framing to a shop, then state that they are to have a water bar on the one edge.

There are various makers of pavement lights.

There are special restrictions as to the length and width of pavement lights in the various districts.

See Mason, notes to clause No. 50, relating to street kerbing, which would apply to the kerbs of pavement lights.

Stall-board lights to shop.

Allow a p.c. sum. These are made in somewhat a similar way to pavement lights, and may be partly ventilated.

Circular floor lights for cellars.

(**19**)—Used for cellars and similar positions, in 10 in., 12 in., 14 in., 16 in., 18 in., 22 in. and 25 in. diameters, and either diamond or semi-prism lenses.

Patent reflectors.

(**20**)—Allow a p.c. sum.

These are very useful for reflecting light into dark places from the outside, and are slung up to the outside wall with chains.

Re-glazing to broken glass and re-puttying.

(**21**)—Hack out all broken glass and cracked or starred glass over 1 in. long, re-glaze with new of similar kind. Hack out defective or perished putties and re-putty.

PAINTER.

Outside paintwork will last longer if done in the spring or autumn, preferably it should be done in the spring.

Unseasoned woodwork covered with paint decays sooner than if left exposed.

Woodwork should be specially prepared in the finishing, if it is to be painted an enamel white, otherwise the grain of the wood will show through the paint; see Carpenter, clause No. 5, with notes.

Woodwork and ordinary plastering should be quite dry before being painted.

When plastering executed in Parian or Keene's cement is to be painted, a coat of paint should be applied before the plastering has had time to dry, see Plasterer, notes to clause No. 21. The remaining coats of paint may be added after.

Ordinary wood and plaster-work require at least four coats of paint, in high-class work six or seven coats, and even more coats may sometimes be applied. Old paintwork repainted requires two or three coats.

Ironwork requires at least three coats of paint.

Paint for internal wood or plaster-work is generally composed of white lead, linseed oil, litharge (driers), a little turpentine, and the colouring pigment. In outside work, boiled oil may be used instead of linseed oil, especially in dark colours, it also assists outside work in the drying. Linseed oil is no good for dark mineral colours, but should only be used for white.

Knotting woodwork is covering over the knots in the wood, either with "size knotting" (the old way, but little used); "patent" (shellac) knotting (the best and usual kind); or silver or gold leaf (not much used). The knots may also be cut out to a slight depth, and filled up with white lead, japan and turpentine, formed into a putty.

Stopping woodwork is filling up the holes and cracks with putty or hard japan stopping, usually with the latter for outside work.

Priming woodwork is usually done with red lead, as it fills up the pores and sets hard.

Flatting is done with paint containing no oil; it leaves a dead surface and the inequalities of the woodwork are not so liable to show as if done in ordinary oil paint; but a little varnish mixed with the flatting coat improves the work and enables it to be the better cleaned. Ordinary flatting will not bear much washing, as it is apt to rub off. Work finished an eggshell gloss is a flatting coat mixed with a little varnish.

Bastard flatting is done by adding a little size to the ordinary flatting, and enables the work to be washed, and is cheaper than if mixed with varnish.

Clearcole is made with white lead, water and size, and is mostly used as a first coat on old plaster surfaces, where much stained or greasy, and before the whitening or distempering is done.

Fresco work is plaster decorated specially while it is wet.

Zinc white (oxide of zinc) gives a more dead white surface than if white lead be used; but more coats are required for the work to bear out. It is not considered so suitable for outside work as lead paint.

White lead paint is suitable both for inside and outside work, but not in positions subject to the fumes of chemicals, as it will discolour. Zinc white may be used in these positions.

Paintwork finished white will turn yellow if unexposed to the light.

Woodwork grained and varnished lasts longer than any other class of painting.

Paint made from oxide of iron is better than white lead paint for ironwork. Rust should be scraped off ironwork before painting. Cast iron should be painted one coat before it leaves the foundry.

Gilding is covering a surface with English gold leaf, it may either be left dead or burnished. First the surface to be gilded is covered with oil gold size for dead gilding, and with burnish gold size for burnished gilding, and then gold leaf is laid over the parts, and either left dead or burnished with a burnisher as the case may be, and sized over. Mat gold is quite dull, and is laid on with water size, it will not bear washing, but may be burnished. Double gilding is two layers of gold leaf.

Enamel paint is sold already mixed, and gives an enamelled surface on the work.

Copal or Coburg varnish is suitable for outside work, and over grained work. White enamel Coburg varnish and French oil varnish are both suitable for varnishing over work finished white as they bleach the work out.

Japanning is lead paint mixed with varnish.

Sanding is throwing sand on paintwork whilst wet on the walls to represent somewhat a stone surface.

Lining paper should be lapped at joints when hung on an already painted surface.

When large pictures are hung against painted plastered walls, it is best not to paint the walls behind the pictures, so that the plaster may absorb any dampness from the air. Pictures should, however, always be kept clear of the walls.

Whitening, colouring and painting should be left until the work is quite dry, otherwise it is liable to be spoilt.

Notices as to separate coats.

(**1**)—The contractor is to give the architect written notice of each separate coat of paint, varnish, colour, distemper or whitening, before applying to either wood, iron, plaster, stone or other work. Separate written notices being given both for interior and exterior work.

How to finish certain woodwork.

See Carpenter, clause No. 5, which may be inserted here.

Each coat a different tint.

(**2**)—Each coat of paint, colour, distemper or whitening to be a different tint to the previous, and the whole of the paint, colour and distemper work to be finished, if practicable, one coat over the whole interior and exterior surfaces before a next coat is applied. The work to be finished from the topmost story downwards.

Finishing coat. (3)—The finishing coat of paint, varnish, colour, distemper or whitening to be done when the building is otherwise entirely completed.

Tints. (4)—All tints to be set up and submitted to the architect for approval.

Imitation of woods. (5)—Samples of imitation woods to be set up and submitted to the architect for approval. The imitation to be done in an artistic manner.

Stencilling. (6)—The stencils to be cut clean, and the stencilling left sharp. The omitted jointing of the stencilling to be put in afterwards with the brush.

Touch up. (7)—Touch up all work at completion.

White lead. (8)—To be best old white lead.

Varnish. (9)—The varnish for interior and exterior work to be best copal.

The varnish to paintwork finished white to be white enamel Coburg (or French oil) varnish.

Stain for woodwork. (10)—The stains to be let down with water to the required tint.

Oil stains may also be used, but are not so transparent as water.

Whitening. (11)—See Plasterer, clause No. 16.

Distemper. (12)—See Plasterer, clause No. 18. There are various patent washable distempers.

Colouring. (13)—See Plasterer, clause No. 17.

Whitewash. (14)—See Plasterer, clause No. 15.

Tar paint to felt roofs. (15)—Boil together, in the proportion of 9 gallons coal tar, 13 lb. slaked lime, 2 (or 3) quarts turpentine (or naphtha), and, after applying, dress over with sand.

Suitable for canvas or felt roofs.

Tar for ordinary work, timber, or iron.

(**16**)—Boil together in the proportion of 6 gallons coal tar, 1 lb. resin, 1 lb. pitch, and apply hot.

or,

Stockholm tar, 6 gallons to 1 lb. pitch.

Oil paint.

(**17**)—Oil colours to be mixed on the premises, and composed of best white lead, pure linseed oil, a small amount of spirits of turpentine, driers and a colouring pigment. Boiled oil to be used for outside work.

Knotting and stopping (ordinary work).

(**18**)—Knot woodwork with "patent" knotting (or size knotting), stop with hard japan stopping (or putty) and prepare for paint.

or,

Knotting and stopping (high-class work).

Knot woodwork with silver or gold leaf, stop with hard japan stopping (or putty) and prepare for paint.

or,

Cut out knots to a slight depth and fill up with hard japan stopping.

Rub down between each coat.

(**19**)—Rub down wood and iron work with sand-paper and stop between each separate coat. Face down, and stop plaster-work between each separate coat.

In preparing old woodwork, it must be pumice-stoned down.

Analysis.

(**20**)—Allow the sum of (say) £10. 10s. for analysis of paint.

Wood and iron work to kitchen, offices and servants' rooms may be finished:—

In paint, one tint all over.

or,

Grained and varnished.

or,

Stained and varnished.

Wood and ironwork to servants' bedrooms is generally finished in paint, one tint all over.

Wood and iron work to best rooms, either living or bedrooms, may be finished:—

In paint in party colours (that is, in different tints) with the mouldings picked in separate tints, or with the mouldings gilt.

or,

The work may be finished a flat in the same tints, with the mouldings picked in.

or,

The work may be finished a white flat, and varnished.

or,

The work may be grained and varnished.

Wood and iron work on staircases, halls and landings may be :—

Grained and varnished.

or,

Painted in party colours, with the mouldings picked in.

The treads and risers may be finished white, or grained and varnished.

The skirtings may be grained and varnished, or marbled and varnished.

Wood and iron work to stables may be :—

Grained and varnished.

or,

Stained and varnished.

Or, on the outside, where not subject to much wear, it may be finished in ordinary paint.

Internal Painted Work.

For painting to wood, iron and plaster in high-class work, see the various paragraphs under clause No. 45; and for distempering to high-class work, see the same clause.

Internal wood and iron work (ordinary work).

(**21**)—Prime one coat in red lead priming, and paint all ironwork, internal wrought deal and pine woodwork to windows, doors, skirtings, panellings, cornices, framings, partitions, staircases, cupboards, presses, sink fronts, dressers and other fittings, fitments and finishing in three (or four) coats of oil colour to tints.

Plate racks, foot boards, dresser tops, table flaps, table tops; shelving in larders, pantry, presses, cupboards and other positions, are not to be painted; but the edges of shelves in cupboards, except in linen cupboard, and both sides of all cupboard doors to be painted to match the other work.

State if any of the work is to be finished in party colours; if finished a flat; if any mouldings are to be picked in separate tints; or if gilt.

Thus, after the general description of the internal paint-work, the description might run as:—

> Finish the dining-room, drawing-room and billiard-room on ground floor, and the two best bedrooms on first floor in party colours, with one (or more) moulding of the architraves, panels and skirtings picked in a separate tint.
>
> or,
>
> The dining-room, drawing-room and billiard-room on ground floor, and the two best bedrooms on first floor to be finished a flat mixed with varnish in party colours, with one (or more) moulding to the architraves, panels and skirtings picked in a separate tint.
>
> or,
>
> Finish the drawing-room a flat white mixed with varnish, and once varnish in French oil varnish.
>
> or,
>
> Finish the dining-room and billiard-room grained and overgrained as wainscot (or pollard) oak (Honduras or Spanish mahogany or other fancy wood), and twice varnish in copal.
>
> or,
>
> Finish the drawing-room grained and overgrained bird's-eye maple, and once varnish in French oil varnish.
>
> or,
>
> Finish the dining-room grained and overgrained Amboyna wood (a very fancy wood), varnish three times in copal, felt down between each coat, and finally hand polish.
>
> or,
>
> Finish kitchen offices comb-grained as oak, and twice varnish in copal.

Comb-graining is a very effective, and a cheap way of graining wood-work.

Graining and overgraining is a better and more expensive imitation of a fancy wood.

In grained work, three coats of paint are often considered sufficient, but in most cases four coats are necessary, and in some cases five.

The actual graining in imitation of oak is done in oil, but with bird's-eye maple, mahogany and similar transparent woods, the graining is done in water colour, as it is the more transparent.

> Paint margins 10 in. wide to treads and risers of stairs, and 15 in. wide to passages, landings and halls,

whether of wood or stone, on all floors, finished a bastard flat and once varnished in copal (or grained and twice varnished).

Balusters to be finished to match the woodwork of stairs, and once varnished; newels to be grained to match the handrail and twice varnished.

Skirtings to stairs, halls, landings and passages to be finished to match the woodwork of stairs (or marbled and twice varnished, or grained and twice varnished).

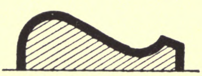
Paint flock paper. See Paperhanger, clause No. 13.

Paint patent raised paper. See Paperhanger, clause No. 7.

Gilding. (**22**)—Gild one (or more) moulding to the architraves, panels and skirtings in drawing-room in English single (or double) gold leaf, left dead (or burnished) and sized.

If varnish touches gold leaf it will spoil it.

Gold beading.



(**23**)—Run round walls of drawing and dining room, along the cornice, skirting and architraves of doors and windows, a $\frac{3}{4}$ in. burnished gold moulding fixed with needle points.

This beading is not much now used.

These mouldings may be obtained in black and gold, plain polished black, or polished stained woods, in $\frac{1}{2}$ in., $\frac{5}{8}$ in., $\frac{3}{4}$ in., 1 in., $1\frac{1}{4}$ in., $1\frac{1}{2}$ in., $1\frac{3}{4}$ in. and 2 in. sizes.

Staining. (**24**)—Stain, stop, twice size and twice varnish in copal the woodwork to kitchen and servants' offices.

The deal work is very effective without staining if clean in figure.

Stain, stop, twice size and twice varnish in copal the pitch pine in hall.

Pitch pine is very effective without the staining.

Plain deal or pine-wood chimney-pieces. (**25**)—To be finished to match the other work of rooms.

Floor margins. (**26**)—Plane down, stain, stop, twice size and twice varnish floor margins 2 ft. wide to dining-room, drawing-room, billiard-room, and bedrooms on first floor.

In old work the description would be, "Scrape, stain, size and twice varnish floor margins."

Iron chimney-pieces.

(**27**)—May be painted to match the other work, or grained and twice varnished, or marbled and twice varnished.

Iron coil cases and gratings.

(**28**)—The iron coil cases, and gratings in walls to be painted to match the other work, the gratings in floors to be finished black.

Ironwork not exposed to view.

(**29**)—All iron or steel joists, carriages, girders, lintels, flitches, columns, rods, plates and other steel or iron work bedded in floors, walls or in other parts not exposed to view, to be painted two coats in oil colour, in addition to one coat to be received at the place of manufacture.

Straps and bolts.

(**30**)—See Smith, clauses Nos. 7 and 19, and Carpenter, clauses Nos. 74 and 75.

Old wood, iron or plaster work repainted.

(**31**)—Clean old paintwork and touch up.

or,

Touch up old varnished work, and once varnish in copal.

or,

Pumice stone down existing paintwork to a smooth face, stop, prepare and paint two (or three) coats oil colour. Where the work is much worn, it is to have additional coats so as to bear out.

State how finished, as any of the ways mentioned under clause No. 20.

Generally on old work two or three coats will be found sufficient, unless the work be very bad, when four coats may be required.

Where old work has been blistered by the sun, it may be burned and scraped off and repainted as ordinary new work.

Cracks in old plaster work, if large, may be required to be filled up in Parian cement.

French polish.

(**32**)—Stop and French polish all oak, walnut and mahogany (or other fancy wood) work.

Generally required to bath and w.c. casings, handrails, table flaps and panelling.

Old French polished work.

(**33**)—Revive French polished work.

or,

Scrape, stop and re-French polish mahogany, oak, walnut (or other fancy wood) work.

Polish oak floors. (**34**)—Stop and French polish oak floors.

Floors may also be wax polished, when a dull polish is required, or if the floor is required for dancing.

Also see Carpenter, notes to clause No. 67.

Old oak floors. (**35**)—Plane, scrape, touch up, stop and re-French (or re-wax) polish oak floors.

If the oak floors are not discoloured or uneven they will not require planing over. Also see Carpenter, notes to clause No. 67.

Paint plaster soffits, ceilings, coves, cornices and centre flowers (ordinary work). (**36**)—See under clause No. 45, which would be modified to the amount of coats and labour to be expended.

State if any mouldings to cornices, coves, centre flowers or ceiling ribs are picked in different tints, or if gilt.

Paint plaster walls. (**37**)—See under clause No. 45, which would be modified to the amount of coats and labour to be expended.

State if any mouldings on panelled walls are picked in different tints, or if gilt; if there be a dado painted a different colour to the filling above; if with an 1 in. line border on top, or a 3 in. stencilled border. Where there is no cornice a $1\frac{1}{4}$ in. line border may be described against the ceiling, or a 3 in. stencilled border.

Cement skirtings and reveals. (**38**)—State if painted, grained or marbled.

Stipple glass. (**39**)—Stipple the glass in w.c. windows white.

Whitening to soffits, ceilings, coves, cornices and centre flowers to new or old work. (**40**)—See the paragraphs in Plasterer, clause No. 59.

State if mouldings to cornices, coves, centre flowers or ceiling ribs are picked in different tints, or if gilt.

Distempering to soffits, ceilings, cornices, coves and centre flowers to new or old work. (**41**)—See Plasterer, clause No. 60.

State if mouldings to cornices, coves, centre flowers or ceiling ribs are picked in different tints, or if gilt.

Distempering to walls, new or old.

(**42**)—See Plasterer, clause No. 60; and see the notes to clause No. 37 as to picking in mouldings on walls, or line or stencilled borders, or dado a different tint.

Colouring to walls, new or old.

(**43**)—See Plasterer, clause No. 61.

Whitewash walls, new or old.

(**44**)—See Plasterer, clause No. 62.

Paint on plaster walls in high class work, new or old.

(**45**)—Painting on internal plaster walls to high-class work may be described as:—

Face down, stop and prepare plasterwork of walls to a smooth face, paint one coat in oil colour, fill up with distemper filling, face down, oil in, paint three (or more) coats in oil colour, and finish one coat stippled in flat colour mixed with varnish to tints with an egg-shell gloss.

If cracks in walls are very bad, they must be cut out and stopped up first in Parian cement.

Painting to plaster ceilings in high-class work, new or old.

Painting on internal ceiling to high-class work may be described as:—

Face down, stop and prepare plaster ceilings, soffits, cornices, coves and centre flowers to a smooth face, fill up with distemper filling, oil in and paint three (or more) coats in oil colour, and finish white one coat stippled a flat mixed with varnish, egg-shell gloss.

If badly cracked, either cut out and fill up with Parian cement, or line with lining paper.

Painting to wood and iron work in high-class work, new or old.

Painting to wood and iron work in high-class work may be described as:—

Face down, prepare wood and iron work, fill up in hard stopping, paint one oil, fill up in distemper filling, rub down, oil in, paint three (or more) coats in oil colour, and finish one coat flat white, mixed with varnish, and once varnish over in French oil varnish (or white enamel varnish).

State if backs of shutters are to have less coats of paint.

Distempering to ceiling or walls in high-class work, new or old.

Fill up cracks in Parian cement, prepare ceilings and walls, line with stout white elephant lining paper, lap and cut down joints, clearcole, and distemper to tints.

Numbers and names to rooms. (**46**)—Paint in block letters $1\frac{1}{2}$ in. deep separate number on each bedroom door.

These numbers may be in enamelled china or iron plates screwed on.

Paint "W.C." on each w.c. door.
Paint "Bath-Room" on each bath-room door.
Paint "Lavatory" on each lavatory door.

Describe any other lettering required.

Description of cisterns and pipes. (**47**)—Paint on all cistern casings to hot, cold and heating pipes, a description as to what the cisterns supply.

Attach zinc (or copper) labels to all stop-cocks to gas, hot and cold water, heating and fire hydrant pipes, with a printed description as to what they control.

Names of bells and speaking tubes. (**48**)—Paint on bell boards the rooms to or from which the bells ring.

Attach to walls near all bell pulls and speaking tubes, small ivory labels with the names of the rooms to which they speak, printed on.

Painting pipes. (**49**)—All gas, hot, cold, heating and other pipes, whether lead or iron, plain or galvanised, to be painted three coats in oil colour where exposed to view, and two coats where not exposed to view; but heating coils behind coil cases to be twice distempered.

Also see Gasfitter, clause No. 1 Plumber, clauses Nos. 23 and 63; and Smith, clause No. 106.

W.C. seats. (**50**)—See Carpenter, clauses Nos. 282 to 284.

Clean glazed and enamelled brick and tile work. (**51**)—Wash and leather down glazed and enamelled brickwork and tilework.

Relacquer old brasswork and clean ironmongery. (**52**)—Take off all ironmongery from windows, doors, cupboards and fittings before commencing to paint. Clean all locks, oil, and supply with keys where missing. Put new ironmongery where damaged or broken. Clean and relacquer all brasswork, including picture rods and curtain poles, and refix all ironmongery. Rejapan all japanned work.

Brasswork may be fairly well cleaned up with oxalic acid if relacquering is not desired.

Sweep flues. (**53**)—Sweep all old flues before commencing to paint.

Clean windows and scrub floors. (54)—See Preliminary Items, clauses Nos. 70 and 69.

Clean marble chimney-pieces. (55)—See Mason, clause No. 125.

The polishing to marble chimney-pieces, or other marble work, may be revived by slightly polishing with putty powder, after being cleaned with plain soap and water. Plain soap and water is best for cleaning delicate marbles. When marble is very much scratched it must be entirely gritted down and repolished.

Electric light casings. (55a)—Paint electric light casings to match the other work where they come across.

See Electric Lighting, clause No. 4, with notes.

External Painting.

External wood-work (ordinary). (56)—Prime in red lead, and paint all external wrought woodwork to doors, windows, skylights, traps, fascias, soffits, barges, verandahs, roofs, gates and other parts, in three (or four) coats oil colour.

State if the last coat is finished in varnish; if the work is varnished over; if the sashes are picked in a different tint to the frames; if the work is finished in party colours; or if grained and varnished.

Front door. The front door to be finished in party colours, and twice varnished (or grained and twice varnished), with the number lettered on in English gold leaf 3 in. deep, double gilt.

Back door. Paint "Tradesmen's Entrance" in block letters 2 in. deep on back door.

Name of house. Paint the name of the house on the front entrance gates (or in gold leaf) 2 in. deep.

French polishing. (57)—Describe any French polishing to mahogany or other hard woodwork, see clauses Nos. 32 and 33.

French polishing is not suitable for outside work; the best way is to slightly bring the work forward with French polish, and then twice varnish it over.

Old work. (58)—See clause No. 31.

Ironwork. (58a)—Paint all railings, gates, guards, grills, gratings and other ironwork; lead or iron soil, ventilating, stack and waste pipes, and heads and eaves gutters inside and out, three times in oil colour.

All zinc and galvanised ironwork to be first coated with a compound, and then painted as in the other ironwork.

Rain-water pipes may be heated and coated inside with tar.

Ironwork is perhaps better painted with oxide of iron paint.

Paint will the better adhere to zinc surfaces if they be first coated over with some patent compound. It is not, however, always done.

Painting to stucco-work.

(59)—See clause No. 65 in Plasterer.

Old plasterwork will only require two or three coats. State if only the reveals of windows and doors are painted.

Colouring to stucco-work.

(60)—See clauses Nos. 65 and 66 in Plasterer.

Painting on brick-work.

(61)—Usually requires five or six coats. Enamel paint may be used. On old work two or three coats may be sufficient.

Cement-wash on old work.

(62)—See clause No. 72 in Plasterer.

PAPERHANGER.

English papers are made 21 in. wide in 12-yard lengths.

French papers are generally 18 in. wide in 9-yard lengths.

Lining papers are made $22\frac{1}{2}$ in. wide by 12 yards long, and may be obtained either plain white, or plain distemper tints, or in plain oil tints.

In common papers the pattern is printed on the natural colour of the paper.

Sanitary papers are common papers made washable.

Some papers are made with a varnished surface.

Satin paper is first painted over, then polished, and the pattern printed on afterwards; it should always be hung with a lining paper underneath, as it is very liable to stain.

Best papers are printed by hand; common papers are machine printed.

Flock papers have the pattern raised with flock.

There are several kinds of papers made with a raised surface, which are suitable for painting.

Papers containing arsenic should not be used.

Plastering should be quite dry before paper is hung.

Thin sheet lead, tin-foil, gutta-percha, india-rubber and thick brown paper are used on walls in damp places to keep back the damp, but it is better to let the walls dry out. These coverings are, however, useless, as a remedy, if the walls are permanently damp.

Dining-rooms are often papered with a dado and border, and a filling above.

Drawing-rooms are either papered all over, or with a filling and frieze. Best bedrooms may be done in the same way.

Common bedrooms are generally papered all over.

Staircases, halls and passages are either plain papered all over, or else with a dado and border, and filling above. State if the dado and border are twice sized and twice varnished. Staircases, halls and passages are also papered all over with marble paper, twice sized and twice varnished, and lined out with pencil in blocks.

Bath-rooms and w.c.'s are either papered all over, twice sized and twice varnished; or else papered with an already varnished paper, but in these positions it is preferable to varnish the paper over.

Papering should be left until the walls are quite dry, otherwise the paper will be spoilt.

Prepare walls. (1)—The walls and ceilings to be stopped, rubbed down, sized and carefully prepared to receive the papers.

Size. (2)—" Double size " to be used.

" Double size " is twice the strength of ordinary size.

Paste. (3)—To be made from best white sifted wheat flour, alum and clean boiling water.

Prime cost. (4)—See Preliminary Items, clause No. 65, and in addition allow for preparing walls or ceilings and hanging.

The discount allowed off the list prices of paper is usually 33⅓ per cent.

Hanging papers. (5)—All papers to be cut close on both sides and hung with butt joints.

Satin paper to drawing-room. (6)—Line walls of drawing-room with stout elephant lining paper, lapped at joints and rubbed down, size and paper with satin paper of the p.c. value 5s. per piece. Hang a frieze paper 15 in. deep of the p.c. value 1s. per yard run.

The lining paper may be distempered over and rubbed down before papering.

Hand-printed paper to dining-room. (7)—Hang walls of dining-room with a hand-printed paper dado 3 ft. high, of the p.c. value 1s. 6d. per yard run, a border 4 in. deep of the p.c. value 3d. per yard run, a paper filling above of the p.c. value 3s. per piece, and a frieze 15 in. deep of the p.c. value 1s. per yard run.

or,

The dado to be lined with thick brown paper, sized, and covered with a patent raised paper of the p.c. value 2s. 6d. per yard run; paint two coats in oil colour, and pick out the ornament in a separate tint (or in gold).

When a raised paper dado is used, a dado rail is generally put; see in Carpenter, clause No. 204.

First-floor bedrooms. (8)—Hang walls of first-floor bedrooms with hand-printed papers of the p.c. value 2s. 6d. per piece.

Second-floor bedrooms. (9)—Hang walls of second-floor bedrooms with machine-printed (or sanitary) papers of the p.c. value 1s. 3d. per piece, with an 1 in. paper line border against ceiling (only required if there be no cornice).

Staircase. (10)—Hang on staircase walls a hand-printed paper dado 3 ft. high of the p.c. value 1s. 6d. per yard run, a paper border 4 in. deep of the p.c. value 3d. per yard run, and a paper filling of the p.c. value 2s. 6d. per piece.

or,

Hang walls of staircase with marble paper of the p.c. value 2s. per piece, line out in pencil blocks, twice size and twice varnish.

Varnished marble papers are seldom now used, but they wear well.

Old marble paper on staircase repapered. (**11**)—Distemper over marble paper on staircase, rub and sandpaper down, size and hang a paper of the p.c. value 2s. 6d. per piece (or with marble paper varnished as clause No. 10).

W.C. and bath-room. (**12**)—Hang walls of w.c. and bath-room with a tile-pattern paper of the p.c. value 2s. 6d. per piece, twice size and twice varnish.

or,

Hang walls of w.c. and bath-room with a varnished tile paper of the p.c. value 3s. per piece.

Paper already varnished is not so good as varnishing over paper, as the joints of the varnished paper when trimmed down are without varnish.

Ceiling paper. (**13**)—Hang paper of the p.c. value of 2s. 6d. per piece on ceiling of morning-room.

or,

Hang ceiling of drawing-room with flock paper of the p.c. value 15s. per piece, size and paint two coats oil colour, the raised surfaces to be rolled flat a separate tint.

Old paper removed. (**14**)—Strip off old paper, stop up cracks in Parian, rub down, stop, size and paper walls (describe the paper and state where).

The old walls may be distempered and rubbed down before repapering.

Gold mouldings (**15**)—See Painter, clause No. 23.

GENERAL REPAIRS AND ALTERATIONS.

The following general clauses may be taken as embracing the whole of the building; but in some cases it is as well to describe the particular repairs separately to each room or other part of the building.

Roof. Take out cracked and broken slates (or tiles), put new of similar kind, and fix with lead (or copper) tingles.

Redress the lead (or zinc) work, and relay with new where cracked. Clean out gutters, cesspools and stack pipes. Rejoint stack pipes, and paint two oils. Paint eaves gutters and rain-water heads inside and out, three oils.

Point in cement to defective flashings.

Rake out open joints of brickwork to chimney stacks, parapets, party walls and copings, and point in cement a weather joint. (If any walls are rendered, state, hack off loose rendering, and re-render in cement.) Reset and point stone coping in cement. Restore missing chimney pots, reset all pots and flaunch in cement. Repair woodwork and paint three oils.

Externally. Erect scaffold, rake out joints of brickwork to all external walls of building, clean down, stain and weather joint point in cement (or tinted mortar), remove scaffold and make good putlog holes.

or,

Erect scaffold, rake out joints of brickwork to all external walls of building, clean down, stain, fill up joints in mortar, and tuck joint point in fine stuff; remove scaffold and make good putlog holes.

Rake out joints of brickwork to garden walls, and point up in blue-ash mortar (or cement).

Repair all cement sills, reveals, cornices and mouldings in neat cement. Hack off loose and decayed cement-work, and re-render in cement and sand.

Take down, and rebuild bulged portion of area walls in cement, and reset coping.

Repair damaged ironwork and rehang gate.

Internally. Hack out all broken glass, and cracked or starred glass over 1 in. long, reglaze with new of similar kind. Hack out defective or perished putties and reputty.

Take up carpets, beat and relay.

Cover up and protect all furniture.

Examine, repair and Berlin (or Brunswick) black all stoves and ranges, and put in working order. Put new fire lumps where worn out or broken. Point up in cement round stoves and ranges. Take out cracked or damaged cement (stone or marble) hearths, and put new of similar kind.

Clean and bleach with potash the white marble mantelpieces and curbs, reset where loose, and repair where damaged.

Ease all sashes, casements, doors and other woodwork, repair all decayed or damaged parts, and tighten up mouldings. Put new sash lines to windows, and cords to skylights where worn or broken.

Put speaking tubes in working order, and repair fittings, and put new where missing.

Fix loose floor boards, and put new where perished or much worn. Take out decayed joists and put new.

Repair cement work to copper, and put new fire-door and fire-bars, and new copper (or galvanised iron) copper.

Cut out all broken, loose or cracked plaster to ceilings, soffits, walls, cornices, centre flowers and mouldings, and replaster. Carefully wash out the enriched parts, so that they show up sharp.

Test all gas fittings and pipes and put in working order, rebronze and relacquer the fittings.

Where the paintwork is perished, it is to have extra coats of paint so that it may bear out; as also to all new parts of woodwork where repaired.

Touch up all work at completion.

Describe repairs to any other items which may appear defective.

For further requirements in the nature of repairs, alterations or items which may bear upon these works, see also:—

Preliminary Items, clauses Nos. 1 to 80 generally, selecting out those which may be required.

Drainage, clauses Nos. 28 to 35 and 60.

Excavator, clauses Nos. 8, 13, 14 and 33.

Pavior, clause No. 3.

Bricklayer, clauses Nos. 2, 21, 34, 40, 69, 89a, 94 and 108.

Mason, clauses Nos. 46, 62, 89, 103a, 106, 125 and 128.

Carpenter, clauses Nos. 11, 31, 42, 69, 158, 162, 167, 199, 226, 254, 275, 318 and 333.

Smith and Founder, clauses Nos. 23 and 82.

Slater, clause No. 14.

Plumber, clauses Nos. 47 and 65.

Plasterer, clauses Nos. 14, 55 to 57, 59 to 62, 64 and 72.

Bellhanger, clause No. 11.

Glazier, clauses Nos. 2 and 21.

Painter, clauses Nos. 26, 31, 33, 35, 40 to 48, 51 to 55a, 58, 59 and 62.

Paperhanger, clauses Nos. 11 and 14.

Road-making, clauses Nos. 15, 29 and 31.

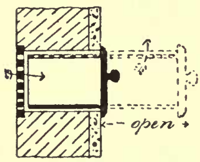
Electric lighting, clauses Nos. 4, 7 and 23.

VENTILATION.

Generally speaking, air inlets should be low down, and air outlets high up, in opposite positions.

Each air inlet should not be of a greater area than 48 to 60 square inches; this will allow sufficient air to pass through per hour for the requirements of two persons. "Tobin's" tube air inlets may therefore be made about these sizes, see Carpenter, clause No. 312, and Bricklayer, clause No. 57.

Air may also be brought into a room through a drawer inlet, with a perforated zinc or fly wire on top; the drawer can be opened and closed at will.



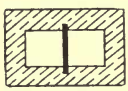
Air may also be brought into a room between the meeting rails of a sash window, a deep bead being provided on the oak sill so that the lower sash may be slightly raised without feeling a draught at the sill level, see Carpenter, notes to clause No. 144, with the sketches to clauses Nos. 144 and 146 in Carpenter. For other air inlets through windows, see Carpenter, clauses Nos. 148, 152 and 177 with sketches.

Fanlights over doors and windows may be used either as air inlets or outlets.

Air outlets may be twice the size of air inlets.

Patent glass louvre and disc ventilators may be fixed in a window, either as inlets or outlets, see Glazier, clause No. 17.

Air outlets may be taken up a flue beside the chimney flue with an iron plate "with" between; this plate becomes heated and assists the upcast, see clause No. 56 in Bricklayer. Air outlets may also be taken from the ceiling level into these flues, or else along the joists to the external walls with hit-and-miss gratings in the ceiling and ordinary gratings in the outer walls.



Air will pass through mortar, brick, sandstone and plaster, but not through paper or limestone. The ordinary fitting window when shut will allow from 5 to 8 cubic feet of air to pass into a room per minute.

A room to be healthy should be provided with 3000 cubic feet of pure air per person per hour. Air must not be changed in a room more than three or four times per hour to be without draught; therefore a room should contain from 750 to 1000 cubic feet of space per person, which being changed three or four times per hour, would give 3000 cubic feet of air per person per hour. The cubical contents of a room should only be reckoned up to 12 feet high, as above that height the air is mostly stagnant. The space the furniture occupies must also be allowed for in calculating the available cubic contents of a room.

An ordinary fire-grate will provide an outlet for about 10,000 cubic feet of air per hour, or sufficient for four or five persons.

A one-gas pendant with an air-outlet tube above will discharge 1000 cubic feet of air per 1 cubic foot of gas consumed; and an ordinary gas burner will consume 3 cubic feet of gas per hour and produce 6 cubic feet of carbonic acid per hour, and consume as much oxygen as five persons. Two sperm candles, or one good oil lamp, consume as much oxygen as five or six persons, and give out as much carbonic acid.

Each person exhales 0·6 cubic foot of carbonic acid per hour.

Pure air contains per 100 parts:—

20·815 parts of oxygen,
79·185 parts of nitrogen,
0·06 parts of carbonic acid, and a small percentage of argon.

ROAD-MAKING.

Roads and footpaths may be divided under two headings, "paved" and "metalled."

Paved roads require a fall of $\frac{3}{8}$ in. to the foot each way from the crown to the side channels, and metalled roads $\frac{1}{2}$ in. to $\frac{3}{4}$ in. to the foot.

Paved footpaths require a fall of $\frac{1}{4}$ in. to the foot from the highest point to the kerb, and metalled footpaths $\frac{1}{2}$ in. to the foot.

In paved roads the bottoming or foundation should be of concrete 9 in. to 12 in. thick. In metalled roads the bottoming may be 6 in., 9 in. or 12 in. thick, and formed either of chalk, burnt clay, ballast, gravel, hard core, slag, flints, or hard broken bricks according to the locality. It should be laid in two thicknesses, each layer being rolled and consolidated with a 3 horse-power steam roller. If the natural earth be solid gravel, chalk, or rock, no artificial foundation or bottoming is absolutely necessary, the top metalling being then only required.

In paved roads the top surface may be of granite setts, asphalt, wood blocks, or tar paving.

In metalled roads the metalling should be at least 6 in. thick, and may be of broken Guernsey, Aberdeen, Leicester, or Cornish granites; trap rocks, greenstones, basalts, Silurian grits, flints, gravel, sandstones (limestones are not good), or beach pebbles, according to the locality, all of which should pass a 2 in. ($1\frac{1}{2}$ in. or $2\frac{1}{2}$ in.) ring and be laid in two thicknesses, each layer being rolled with a 3 horse-power steam roller, with fine gravel or sand as a binding material.

Paved footpaths may be laid with York stone, slate, granite, or other stone flagging, or with artificial stone paving, on a hard core or concrete bedding. They may also be paved with concrete paving, laid "in situ," or asphalt or tar paving, on a concrete bedding.

Metalled footpaths may be covered with fine gravel or stone chippings laid on coarse gravel or stone, and rolled with a 4 cwt. hand roller.

Country roads for vehicular traffic should be at least 36 ft. wide, the footpaths being on each side one-sixth of the entire width of the road. With a road 36 ft. wide, this would allow for the carriage-way 24 ft. in width, with a 6 ft. path on either side. Eight feet is a sufficient width for each vehicle, therefore with a carriage-way 24 ft. wide it would allow three vehicles to pass at one time, a carriage-way should therefore be some multiple of 8 ft. Sixteen feet is enough to turn a carriage and pair, but 20 ft. is desirable, and a large one-horse van requires 20 ft. Kerbs should not be less than 3 in. or more than 7 in. above the road channels. The least width of country roads for foot traffic only should not be less than 24 ft. Many of the turnpike roads are only 30 ft. wide, with footpaths 6 ft. wide.

If possible the gradient of a roadway should not exceed 1 in 40.

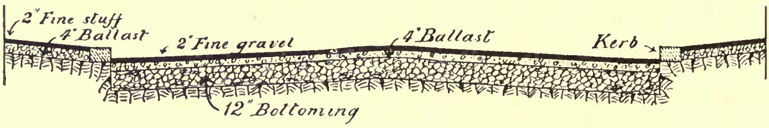
The London Building Act, 1894, requires the entire least width of roads for carriage traffic to be not less than 40 ft., and for foot traffic 20 ft. The gradient to be not less than 1 in 20. The fall from crown to side channels $\frac{3}{8}$ in. per foot. The kerb not less than 4 in. or more than 8 in. above the side channels. The footpaths to have falls of $\frac{1}{4}$ in. to the foot if paved, and $\frac{1}{2}$ in. if metalled.

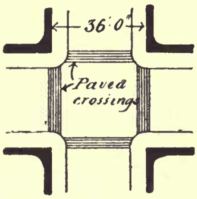
A 36 ft. wide Country Road, or Private Carriage Road, with Footpaths.

(Clauses Nos. 1, 2, 4 and 5.)

Carriage-way.

(**1**)—Excavate ground to an average depth of 18 in. for a carriage-way 24 ft. wide to contour, for a length





of (say) 200 ft., together with two branch roads each having a length of (say) 50 ft., and spread the earth on the properties adjoining (or wheel and deposit 22 yards run, or cart away). Fill in the carriage-way with clean hard gravel core (or large slag, chalk, burnt ballast or hard broken brick) 12 in. deep in two 6 in. layers, each layer being well rolled and consolidated with a 3 horse-power steam roller. Spread over 4 in. clean ballast to pass a 2 in. ring, roll and water, and finish with 2 in. finer ballast on top, also rolled and watered with sufficient sand (clay or loam) for binding purposes, and formed to a curvature of $\frac{1}{2}$ in. to the foot from the crown to the side channels, the crown being slightly rounded for a width of 4 ft. The side channels to fall towards the road gullies.

See clause No. 5 for the "crossings," clause No. 2 for the footpaths and clause No. 4 for the kerb.

The bottoming to carriage-ways may be formed with a layer of 6 in. of burnt ballast and chalk mixed in equal proportions, and 6 in. of hard core on top. Chalk has great binding qualities, but it must be kept from the weather.

The class of road described is very suitable where there is not a very great amount of traffic, such as in parks and private roads to grounds. When in these positions the bottoming may be from 6 in. to 9 in. thick.

Metalled footpaths in gravel to country roads.

(**2**)—Excavate ground for footpaths on either side of carriage-way 6 ft. wide (3 ft., 4 ft. or 5 ft.) to a fall of $\frac{1}{2}$ in. to the foot towards the kerbs, and deposit the earth on the adjoining properties (cart or wheel away), spread 4 in. (or 3 in.) coarse ballast to pass a 2 in. ring, well watered and rolled with a 4 cwt. hand roller, and finish with 2 in. good binding gravel and hoggin, also watered and rolled.

This form of footpath is suitable for country lanes and private roads.
Any hard core 3 in., 4 in. to 6 in. deep may be used as a bottoming to footpaths. The top layer, from 2 in. to 3 in. thick, may be in granite or other hard stone, or quarry chippings. Screened cinders make a dry foundation, both for paths and roads.
A good pathway suitable for lanes and across private properties may be made with screened cinders 3 in. to 4 in. thick, with the screenings on top about 1 in. to 2 in. thick well rolled in.

Paths or footways may also be formed of natural asphalts, artificial asphalts, brick, stone, granite, slate or concrete paving; and instead of being paved over the entire width with any of these materials, they may have a portion paved over only from 2 ft. 6 in. to 4 ft. or 5 ft. wide along the centre. Clause No. 2 would refer to the side metalling, and any of the following clauses, Nos. 3, 6 to 14, 16, 17, 26 and 34, would apply to the centre portion.

Paved Footways.

(Clauses Nos. 3 to 14, 16, 17 and 34.)

A good tar pavement to footway.

(3)—Excavate ground for footpath on either side of carriage-way 6 ft. (3 ft., 4 ft. or 5 ft.) wide to a fall of $\frac{1}{4}$ in. (or $\frac{3}{8}$ in.) to the foot towards kerb, and deposit (cart or wheel) on adjoining properties. Spread 4 in. tar paving composed of limestone clippings screened through sieves of $1\frac{1}{4}$ in., $\frac{3}{4}$ in., $\frac{1}{2}$ in. and $\frac{1}{4}$ in. meshes, 1 ton of which is to be mixed with a boiling composition composed of 12 gallons of doubly distilled tar, $\frac{1}{2}$ cwt. pitch, and 2 gallons creosote; the larger stones being placed at the bottom and worked up with the finer to the top, and dressed over with fine grit or stone dust, and rolled in with a 10 cwt. hand roller.

Derbyshire limestone chippings or broken Kentish rag make the best tar pavements, and may be laid 2 in. (or $1\frac{1}{2}$ in.) thick to pass an $1\frac{1}{4}$ in. ring, and 1 in. thick to pass a $\frac{1}{2}$ in. ring mixed with doubly distilled tar, and with the fine grit dressing on top, as before. This will make as good a pavement as that just described.
There are patent tar pavings made somewhat similar to the above, and about $2\frac{1}{2}$ or 3 in. thick for foot traffic and 4 in. thick for roads and promenades.
Tar paving for footpaths is much used in suburban districts. Tar paving is laid $2\frac{1}{2}$ in., 3 in. and 4 in. thick for foot traffic; and 6 in. and 9 in. thick for roads and promenades.

Hard core 3 in. thick, or 3 in. of cement concrete, may be required as a foundation in some positions before the tar paving is laid.

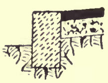
Gravel tar paving is mixed in the same way as limestone, but it wears lumpy; limestone tar paving wears more evenly.

If the tar is doubly distilled, the paving is not liable to smell. In tar pavements, the limestone, Kentish rag or gravel is first heated, and the boiling tar then thrown over it.

Kerb.

(**4**)—To be in 12 in. × 6 in. Aberdeen granite, laid flat (or on edge) in lengths of not less than 3 ft. (5 ft. is a good length), with the top and front surfaces finely dressed (axed), and the back edge and ends squared and dressed (drafted) 1 in. down and jointed together in cement mortar. The kerb corners to be in similar 12 in. × 6 in. Aberdeen granite worked to a circular sweep 18 in. external radius (or other sweep, the size mentioned being about the least possible sweep for a road at right angles).

Finely axed hard Norway granite kerbs are also much used.



Kerbs are generally 5 in. × 10 in., 6 in. × 10 in., 5 in. × 12 in. and 6 in. × 12 in. laid on edge; or 6 in. × 12 in. and 8 in. × 12 in. laid flat; when laid flat, a cement concrete bed under is desirable, say 12 in. wide × 6 in. to 9 in. deep; when laid on edge, concrete is not necessary, unless the foundation be bad. If the foundation be hard then the concrete bed is not necessary in either case. The outer top edge of kerbs is sometimes bevelled off.

Crossings.

(**5**)—Pave the four crossings 3 ft. 6 in. (or other) wide with fairly well dressed 3 in. (4 in. or 5 in.) Aberdeen granite setts 7 in. deep, laid in parallel courses in fine gravel on a 9 in. (or 6 in.) cement concrete bed, and grouted in cement and well rammed. The setts to be square the full width and kept close together.

Crossing setts may also be in Aberdeen, Cornish, Enderby or Mount Sorrel granite, 5 in., 8 in. or 9 in. deep.

York paving to footway.

(**6**)—Describe the excavating as clause No. 2. The paving to be laid to a fall of $\frac{1}{4}$ in. to the foot towards the kerb, with $2\frac{1}{2}$ in. quarry-worked, tooled, hard York stone flags, not more than fourteen stones being laid in 100 super. ft., and jointed and laid in parallel courses, with the joints alternately broken, and set and jointed in blue lias lime and sand (or cement and sand) mortar, and bedded in sand on a 4 in. hard gravel (or brick rubbish) bed.

Kerb. See clause No. 4.

York stone flagging is largely used for footpaths in 2 in., 3 in., 4 in., 5 in. and 6 in. thicknesses. It is seldom used with a rubbed face except in private terraces and colonnades. It does not get slippery. All flag pavements of whatever description of stone require a solid foundation, which may be made either of hard core 4 in., 6 in. or 9 in. thick, or lime (or cement) concrete 4 in., 6 in. or 9 in. thick, or with both if the foundation be poor, and whether laid on the hard core or on concrete it requires a sand bedding to take the inequalities of the stone.

Artificial stone paving to footway.

(**7**)—Is laid 2 in., 3 in. and 4 in. thick, in the same way as York paving, 2 in. being the usual thickness (see clause No. 6). Some artificial stones wear well. Also see Mason, clause No. 31.

Bath stone paving to footway.

(**8**)—Is laid 3 in. thick in the same way as York paving (see clause No. 6). Corngrit and Corsham Down are the usual quarries from which Bath stone paving is obtained, but Bath stone is very soft for pavements.

Caithness flagging to footway.

(**9**)—Is laid in the same way and of the same thickness as York paving (see clause No. 6); it makes a capital pavement and does not get slippery.

Slate flagging to footway.

(**10**)—Is laid in a similar way to York paving and does not get slippery (see clause No. 6); it wears well and is not required so thick as ordinary flagging.

Purbeck paving to footway.

(**11**)—Used chiefly in churches (a mixed green in colour). It makes an excellent pavement and is laid $2\frac{1}{2}$ in. thick in the same way as York paving (see clause No. 6), and is used either with a rubbed or tooled face, and either in random or parallel courses.

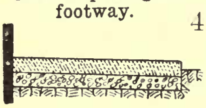
Portland stone paving to footway.

(**12**)—Is laid in a similar way to York paving (see clause No. 6), in $1\frac{1}{2}$ in., 2 in., $2\frac{1}{2}$ in. and 3 in. thicknesses, but with a rubbed face, and chiefly used in private terraces.

Silex paving to footway.

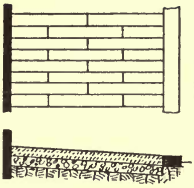
(**13**)—This is a very hard stone and makes one of the best pavements. It is laid in the same way as York paving (see clause No. 6), either 2 in., $2\frac{1}{2}$ in. or 3 in. thick.

Granite paving to footway.



(**14**)—Is laid in a similar way to York paving, 3 in., 4 in., 6 in., 7 in., 8 in. and 9 in. thick (see clause No. 6), and when in the thicker sizes no kerb is necessary. It gets somewhat slippery.

also,

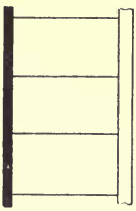


Aberdeen, Cornish, Enderby and Mount Sorrel granite paving is laid in parallel courses 5 in. wide by 5 in., 7 in., 8 in. and 9 in. deep in sand, and jointed in cement as with York paving (see clause No. 6).

Old paving to footways relaid.

(15)—Take up old York (or other) paving, square and relay in lime (or cement) mortar, and make out with new as required.

Concrete paving to footway.



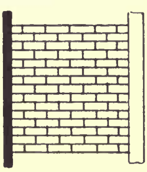
(16)—Describe the excavating as clause No. 2, and a cement concrete bed 6 in. (or 9 in.) thick, and go on:—

Lay 3 in. concrete pavement in two layers in 6 ft. widths with $\frac{3}{8}$ in. laths placed between, the first layer being $2\frac{1}{2}$ in. thick and composed of 1 part Portland cement to 4 parts crushed granite (or other hard stone), and the second layer $\frac{1}{2}$ in. thick, composed of 1 part Portland cement to 2 parts finer granite crushings worked up to a trowelled face, and when thoroughly set, wet sand is to be spread over the face when first used for traffic.

Fine uncrushed shingle or ballast may be used instead of granite or stone, but it is not so good.

There are various patent concrete pavings made, such as granite concrete paving 1 in., 2 in. and 3 in. thick, obtained from Mount Sorrel granite.

Brick paving to footway.



(17)—Describe the excavating as clause No. 2, and a concrete foundation 4 in. (6 in. or 9 in.) thick, and if necessary a hard core under. Lay blue Staffordshire 9 in. $\times$ $4\frac{1}{2}$ in. $\times$ 2 in. paving bricks in cement on an 1 in. (or $\frac{3}{4}$ in.) floated cement (or lime) and sand bedding, and grout in cement.

or,

Ordinary blue Staffordshire bricks $8\frac{3}{4}$ in. $\times$ $4\frac{1}{4}$ in. $\times$ $2\frac{3}{4}$ in.; or chequered blue Staffordshire bricks; or ordinary building brick paviors.

See notes under clause No. 1 in Pavior for brick paving to other positions.

Brick pavements wear very uneven, and blue Staffordshire bricks wear slippery. See that the blue in the blue Staffordshire bricks goes right through the bricks and is not merely surface colour.

Tar Paving to a Public Carriage Drive.

Carriage drive. (18)—Describe the excavation and any core bottoming as clause No. 2. Form the surface of carriage drive with a fall of $\frac{3}{8}$ in. to the foot from crown of road to side channels, the crown being rounded off for a distance of 4 ft. Lay 4 in. (or 5 in.) clean Mendip limestone macadam to pass a 2 in. ring, and $1\frac{1}{2}$ in. (or 2 in.) Mendip limestone macadam to pass a $\frac{3}{4}$ in. ring. Each layer being heated and mixed with boiling tar and well rammed and rolled with a steam roller. Form the channels to falls to the gullies.

Public carriage drives are not often paved with tar pavement.

The promenade. Describe the excavation, and any core bottoming, as clause No. 2. Form the surface of promenade to a fall of $\frac{3}{8}$ in. to the foot towards the kerb. Lay 3 in. gravel to pass a 2 in. ring, $\frac{3}{4}$ in. Mendip limestone to pass a $\frac{3}{4}$ in. ring, and $\frac{3}{4}$ in. Mendip limestone screenings to pass an $\frac{1}{8}$ in. sieve, each layer being heated and mixed with boiling tar and well rolled with a 10 cwt. hand roller.

The paving may also be similar to clause No. 3.

Kerb. See clause No. 4.

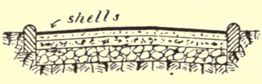
An esplanade. (19)—Describe the excavation and any core bottoming as clause No. 2. Form surface of esplanade to a fall of $\frac{3}{8}$ in. to the foot towards the kerb, lay $1\frac{1}{2}$ in. gravel to pass an $1\frac{1}{2}$ in. ring, $\frac{3}{4}$ in. gravel to pass a $\frac{3}{4}$ in. ring, and $\frac{1}{4}$ in. fine gravel siftings, each layer being heated and mixed with boiling tar (about $1\frac{1}{8}$ gallons per yard super.).

The paving may also be similar to clause No. 3.

Kerb. See clause No. 4.

Garden Paths.

Paths.



(20)—Excavate ground for new paths to an average depth of 12 in. and deposit on the site within 22 yards run (or cart away). Fill in with hard dry brick rubbish 6 in. (or 12 in.) deep, well rammed, and laid to a fall of $\frac{1}{2}$ in. to the foot from the centre to the sides, with the sides falling slightly to the gullies. Cover with good screened gravel 2 in. thick to pass an $1\frac{1}{2}$ in. ring, and fine gravel 1 in. thick, with sufficient logging for binding, and a layer of shells $\frac{1}{2}$ in. thick on top. Each layer to be well rolled and watered.

This will make a first-class path, but must be modified according to the amount to be expended. Shells as a top layer are very suitable and very clean.

A very good garden path may be formed with gravel (or any of the materials mentioned in clause No. 2) to pass a $\frac{3}{4}$ in. ring, mixed with hot tar and pitch (10 gallons of tar to 1 lb. pitch), and laid 3 in. or 4 in. thick on concrete 4 in. deep, and finished with fine binding gravel to pass through a $\frac{1}{2}$ in. mesh sieve, thrown over the surface 1 in. or $1\frac{1}{2}$ in. deep, and well rolled so as to be incorporated with the tar paving beneath. This forms a very solid gravel path which is not liable to kick up, and is very suitable for the best class work. It soon dries up after rain.

Garden edging. (**21**)—Form the edges to paths with plain roll buff garden edging tiles $\frac{3}{4}$ in. thick (state if ornamental).

Garden edging tiles are made in various colours, about $8\frac{3}{4}$ in. long, $6\frac{1}{2}$ in. deep.

A 36 FT. WIDE MACADAM ROAD.

(Clauses Nos. 22 to 24.)

Carriage-way. (**22**)—Excavate ground to an average depth of 18 in. to contour for a carriage-way 24 ft. wide for a length of

(say) 200 ft., together with two branch roads each having a length of (say) 50 ft., and spread the earth on the adjoining properties (or wheel, and deposit 22 yards run or cart away). Fill in the carriage-way with clean hard broken bricks (or other hard core or large slag) 12 in. deep, in two 6 in. layers, each layer being well rolled and consolidated with a 3 horse-power steam roller; and finished on top with 6 in. Guernsey granite metalling to pass a 2 in. ring spread over in two 3 in. thicknesses, each layer being well rolled and watered and incorporated with a sufficient amount of sand and gravel for binding purposes. The carriage-ways to be formed to a contour of $\frac{1}{2}$ in. to the foot fall both ways from the crown to the side channels, and the side channels to fall slightly towards the road gullies.

This is the best form of country road; gravel roads are cheaper, but wear out quicker. Granite macadam is laid 3 in., 4 in., 5 in., 6 in., 7 in., 8 in. and 9 in. deep.

Side channelling. (**23**)—Form the side channelling (gutters) in 5 in. (3 in. or 4 in.) Guernsey granite setts 7 in. deep, three courses wide, laid in fine gravel and bedded and grouted in cement mortar and rammed.

The side channels are not always formed with granite setts; often merely in the road metalling itself.

Crossings. See clause No. 5.

Kerbs. See clause No. 4.

Whinstones, syenites, basalts from the Trappean rocks, Devonshire, Cornish, Aberdeen and Guernsey granites, greenstones, flints and beach pebbles may be used as macadam, to pass a 2 in. ring.

If beach pebbles be used, they require a large amount of gravel. Beach pebbles and flints are the least suitable. Pebbles require a fair amount of hoggin (screenings from gravel) to bind them together owing to their roundness.

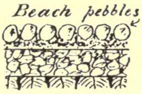
Footpaths. (24)—See clauses Nos. 2, 3, 6 to 14, 16 and 17 and 34.

Pebble paved roads. (25)—Jersey or Guernsey pebble paving may be laid 4 in. or 5 in. deep in screened gravel (hoggin) on a similar depth of bottoming, and in a similar way as described to macadamised roads, see clause No. 22.

This form of road paving is used more for small side streets and alleys; it wears very well.

Beach pebble paving. (26)—Beach pebbles are laid in fine gravel, on a hard foundation and rammed in; they are found mostly in old towns, and seldom now used.

Beach pebbles



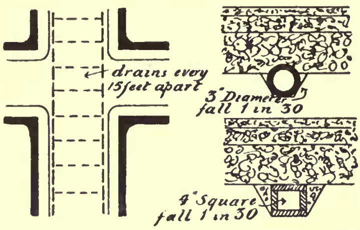
Flint roads. (27)—Flints to pass a $2\frac{1}{2}$ in. ring may be laid in precisely the same way and on the same bottoming, as described to macadamised roads, see clause No. 22. Kentish flints are very suitable.

Flint roads are mostly found in districts where the flints are obtainable locally; but they do not make the best roads.

In all metalled road where the foundation is bad, either more earth must be removed or else faggots or brushwood from 4 in. to 6 in. deep must be laid as a first layer under the road bottoming, and in this case underground cross drains are essential.

Road Drainage.

The size of the drains (sewage drains are not referred to here in any way) depends entirely upon the length of the roads and the number of the outlets. Drains are required both for metalled and paved roads to take the surface water from the road gullies. In metalled roads where the foundation is bad, drains are in addition also required to lead the water that finds its way under the road bottoming into the gullies or other outlets. Thus, if the ground be fairly soft, lay underground drains across the road, say 15 ft. to 20 ft. apart, composed of agricultural tiles, bricks or flat stones, filled in round with small stones, and connected to similar side drains into the gullies or ditch outlets.



In fairly hard ground if the curvature of the road be properly formed, the water will find its way naturally to the sides, and can then be caught up in the side drains under the channelling and led off at once into the road gullies or ditch outlets; the cross drains in this case are not absolutely necessary. Side drains should be laid from 2 ft. to 3 ft. deep. There are various makers of suitable gullies to catch the mud washed from the surface of the roads before the surface water enters the main road drains. The grids must be strong as they are subject to rough usage.

Macadam (or gravel) road on a made-up soil.

(28)—Form ground to curvature and roll with heavy roller, lay bushes 6 in. deep and again roll. Lay cross drains with 2 in. agricultural drain pipes every 15 ft. apart, leading into 4 in. similar side drains connected to gullies. Lay and spread hard core of brick rubbish (or chalk) to pass a 3 in. ring, well roll and consolidate, and coat over with 3 in. of gravel, water and roll, and finish with 3 in. (or 4 in.) of Guernsey granite, macadam metalling to pass a 2 in. ring (or gravel), also water and roll and incorporate with sufficient binding finer gravel, and finish the surface to a fall of ½ in. to the foot from crown to the side channels, the crown being rounded for a distance of 4 ft.

Then describe the channels, kerb and footpaths as in clauses Nos. 22 to 24.

Repairs to existing macadam (or gravel) roads.

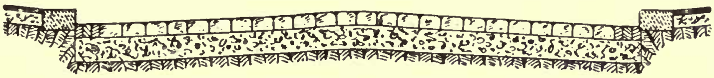
(29)—Pick up the top surface some 3 in. deep, repair, and lay 3 in. Guernsey (or other) granite, metalling (gravel or other road metalling) to pass a 2 in. ring, well water, and roll with a 3 horse-power steam roller, and incorporate with a sufficient amount of fine gravel for binding.

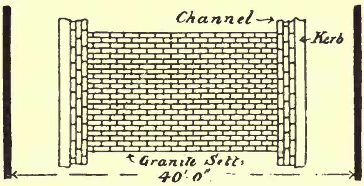
A 40 ft. wide Road paved with Granite Setts.

(Suitable for large towns and cities.)

Carriage-way in granite setts.

(30)—Excavate the ground to an average depth of 18 in. for a carriage-way 28 ft. wide to contour for a





length of (say) 200 ft., together with two branch roads, each having a length of (say) 50 ft., and cart the earth away (or otherwise dispose of). Fill in the carriage-way with cement concrete 9 in. (or 12 in.) thick, composed of 1 part Portland cement to 5 parts ballast and sand, and formed to a fall of $\frac{3}{8}$ in. to the foot from the crown to the side channels, with the crown rounded off some 4 ft. wide. Lay 3 in. × 7 in. deep × 10 in. (to 12 in.) long Aberdeen (or Cornish) granite setts in parallel courses and touching, on a 2 in. sand (or fine ballast or hoggin) bedding, and grout in cement and sand mortar, and well ram. Each stone to be fairly well dressed and squared the full width through.

Channels.

Form the side channels 3 (or 4) courses wide parallel with the length of road, with setts 4 in. × 7 in. deep × 12 in. (to 18 in.) long.

Guernsey pitching may be obtained 5 in. × 6 in. deep, 4 in. × 4 in. deep, 4 in. × 7 in. deep, and 3 in. × 5 in. deep; and Aberdeen pitching 5 in. × 6 in. deep and 3 in. × 5 in. deep.

The length of pitching varies from 8 in., 10 in., 12 in. to 14 in. long.

Setts are also laid on a bed of 12 in. of clay puddle instead of on the concrete.

Crossings.

The crossings to be paved 4 ft. wide, with 4 in. (or 5 in.) × 7 in. deep × 12 in. (to 18 in.) long similar granite setts.

In courts and side streets 4 in. cubes are much used.

Lime concrete, composed of 6 parts ballast to 1 ground stone or hydraulic lime, may be used as a foundation. Enderby granite crossings and channels 5 in. × 7 in. deep are much used.

Kentish rag and many local tough stones are used as paving sett. Granite setts as a paving to roads is about the most lasting of all forms of paving material.

Kerb.

See clause No. 4.

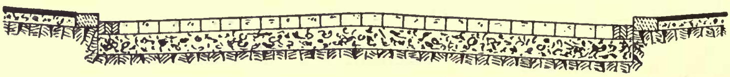
Footpaths. These may be formed in asphalt, or of any other class of paving, see clauses Nos. 3, 6 to 14, 16, 17 and 34. Setts are never used.

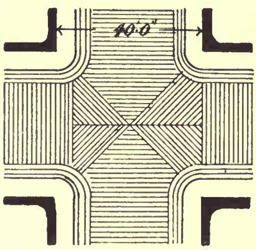
Repairs to old sett paving. (**31**)—Take up and relay the old granite setts on sand and gravel and grout in cement and ram, and make out where required with new.

A 40 ft. wide Road paved with Wood.

(Suitable for large towns and cities.)

Carriage-way. (**32**)—Excavate ground to an average depth of 18 in. for a carriage-way 28 ft. wide to contour, for a length





of (say) 200 ft., together with two branch roads, each having a length of (say) 50 ft., and cart away (or otherwise dispose of).

Fill in the carriage-way with 9 in. (6 in. or 12 in.) cement concrete, composed of 5 parts ballast and sand to 1 Portland cement, and finish with a floated cement face $\frac{3}{4}$ in. (to 1 in.) thick, having a fall of $\frac{3}{8}$ in. to the foot from the crown of road to the side channels, with the crown slightly rounded off some 4 ft. wide. Lay well seasoned 3 in. × 9 in. × 6 in. deep Baltic red fir blocks, free from sap, large knots and shakes, with the end grain uppermost in transverse parallel courses, with $\frac{1}{4}$ in. (or $\frac{3}{8}$ in.) joints kept apart with laths, and the interstices grouted in cement and sand grout in the proportion of 1 Portland cement to 3 of sand; and well rammed and top dressed with fine shingle 1 in. thick. Form the channels to falls to gullies 3 (or 2) blocks wide, laid parallel with the length of roads. An 1 in. (to $1\frac{1}{2}$ in.) space to be left for expansion for twelve months, and filled up in sand in the meantime.

An 1 in. fall in 3 ft. is very good, or $\frac{1}{36}$th of the width (slightly under $\frac{3}{8}$ in. to a foot).

Blocks are also used 3 in. wide × 8 in. and 11 in. long, and 5 in. and 7 in. deep, and may be of Baltic or Dantzic fir, pitch pine, spruce, beech, larch, oak, elm, ash and Swedish yellow deal. Gothenburg thirds are much used. Oak, elm and spruce are least suitable. Jarrah, Karri and other hard wood block paving is now much used, 5 in., 6 in., $4\frac{1}{2}$ in. and 4 in. deep, with $\frac{1}{8}$ in. to $\frac{1}{4}$ in. joints filled in with creosote and pitch grout, or else the blocks are merely dipped in the grout and laid close together, and dressed over with cement grout. Hard wood blocks 9 in. × 3 in. × $4\frac{1}{2}$ in. deep are mostly used.

If the foundation be poor 6 in. to 9 in. hard core or gravel may be laid under the concrete.

The concrete may be hydraulic lime concrete; and whether of cement or lime, it may for cheaper work be worked up roughly to an even face and the blocks laid on sand instead of on a floated cement face.

The grout may be hot lime and sand grout. The blocks may also be laid on and in hot tar, lime and pitch grout, or asphalt; or on a composition composed in the proportions of 6 gallons hot coal tar, mixed with 1 lb. pitch, 1 lb. resin, with the cement grout run in on the top.

An excellent pavement is made by laying similar fir blocks pickled in creosote oil and top dressed with shingle. This is much used in London streets.

About 7 lbs. hot creosote oil is required to a cubic foot of the blocks.

Wood pavement is very suitable for cities and towns where subject to much traffic.

Kerb. See clause No. 4.

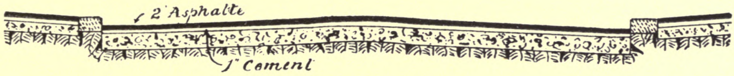
Footpaths. These may be in asphalt or stone paving. See clauses Nos. 3, 6 to 14, 16, 17 and 34.

They are never laid with wood blocks.

A 40 FT. WIDE ROAD PAVED WITH ASPHALT.

(Suitable for large towns and cities.)

Carriage-way. (**33**)—Excavate ground to an average depth of 15 in. for a carriage-way 28 ft. wide to contour for a length



of (say) 200 ft., together with two branch roads, each having a length of (say) 50 ft., and cart excavations away (or otherwise dispose of).

Fill in with 12 in. (or 9 in.) cement concrete, composed of 1 part Portland cement to 5 parts ballast and sand, and float over with Portland cement and sand in equal parts 1 in. (or $\frac{3}{4}$ in.) thick to an even face having a fall of $\frac{3}{8}$ in. per foot each way from the crown to the side channels, the crown being rounded off some 4 ft. wide. Spread ground powdered asphalt 2 in. (or $1\frac{1}{2}$ in.) thick whilst hot, and compress with hot iron rammers. The channels to fall to the street gullies.

Kerb. See clause No. 4.

Asphalt footpaths. (**34**)—Excavate ground to an average depth of 12 in. for the pathways, and cart away (or otherwise dispose of). Lay 9 in. (or 6 in.) cement concrete bed floated over in cement and sand 1 in. (or $\frac{3}{4}$ in.) thick to an even face, with a fall to the kerb of $\frac{1}{4}$ in. to the foot, and spread ground powdered asphalt 1 in. (or $1\frac{1}{4}$ in.) thick whilst hot, and compress with hot iron rammers.

Asphalted paths should not be less than 1 in. thick, or the concrete less than 3 in. thick.

Asphalt for carriage-ways is not suitable for steeper gradients than 1 in 60, as it affords no foothold for the horses.

Mastic asphalt, melted, spread and rubbed to a smooth surface may be used in the same thicknesses, but the powdered state is far more suitable for heavy wear.

Asphalt pavement is much used in cities; it is almost noiseless, but slippery in some weathers.

There are various manufacturers of asphalt.

ELECTRIC LIGHTING.

It is not intended that this article upon electric lighting should embrace a description either of the plant for generating or for the storage of electricity. The notes and descriptions refer only to the wiring of private buildings for an installation of incandescent lamps, and do not include that for arc lamps.

Electricity may be supplied to a building in three ways:—

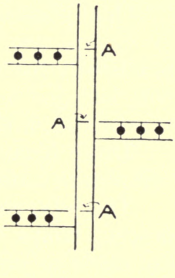
1st. From a Company's mains having a high tension (pressure) transformed down to a low tension within the building.
2nd. From a Company's mains having either a high or low tension, which charge accumulators with electricity, and from which it is distributed over the building.
3rd. From a Company's mains having a low tension taken direct into the building without transforming down to a lower tension.

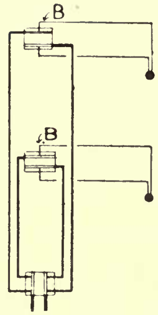
Each of these three systems is severally in vogue in various districts. The wiring to a building would remain practically the same whatever the Company's supply system may be, the only difference being in connecting the Company's mains into the building.
The first of these three systems, that is, the "high tension" system, is that most commonly in use. These notes will refer therefore to the wiring of a building supplied with electricity by that system.

There are two methods usually employed in arranging the wiring to a building:—

1st. That known as the "tree" system.
2nd. The "distributing board" system.

The "tree" system consists in the branch wires being jointed to the main leads. It will be seen from the sketch that if any of the joints at points A be defective, then none of the lamps on that branch would light. This system of wiring will not therefore be further mentioned.





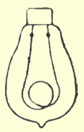
The "distributing board" system consists in taking the main leads to separate distributing boards placed on each of the several floors of the building, and from which separate branch leads are taken to each of the various points. It will be seen by the sketch that should one of the branch leads get damaged, such as at either of the points B, then only the lamp on that branch would be affected.

The distributing board system may be so arranged that it does away with all joints in the wires, the connections being made only at the distributing boards. It is this system of wiring then that will be described.

Joints in the wires should always be avoided if possible, as they are liable to cause trouble through imperfect making. But when they are absolutely necessary, then the only certain way to ensure perfect insulation is to employ what is termed a "vulcanised joint," to make these joints it requires special appliances used by highly skilled workmen.

Here are a few definitions and explanations of some of the terms used in electric lighting. If the sketch on page 522 be referred to when reading these notes, perhaps it may assist the explanations.

The terms "Cable," "Wire," "Conductor," "Lead" and "Branch" are practically all synonymous words; a "Cable" being a number of stranded wires, and a "Wire" being a single strand, but the term "Wire" is often applied to a "Cable"; a "Conductor," "Lead" or "Branch" might refer to either.



Incandescent (glow) lamps have a thin filament of carbon in a hermetically sealed air-exhausted glass globe. These lamps are chiefly used in private buildings, and are made of various illuminating powers from 1 candle-power to 1000 candle-power, and to work with a pressure of from 2 to 120 volts (that is the intensity of the pressure of the current). Those of 8, 16 and 32 candle-powers are mostly employed in the general class of work to private buildings. Small lamps suitable for candle or candelabra fittings are generally from 5 to 10 candle-powers.

Incandescent lamps may be obtained with clear glass, tinted glass, ground or partly ground glass, and partly silvered glass globes.

Clear glass absorbs 10 per cent. of the total light of the lamp.

Ground glass absorbs 30 to 50 per cent. of the total light of the lamp.

Opal glass absorbs 50 to 60 per cent. of the total light of the lamp.

Lamps are supposed to burn for 1000 hours, after which they are practically useless and have to be replaced with new, but some lamps will last for a much longer period and some considerably less. It is very material then that a good class lamp be used.

Large incandescent lamps from 100 to 1000 candle-power are called "Sunbeam Lamps," and are used mostly in shops and public buildings.

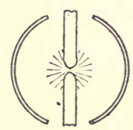
The following list gives some of the various candle-powers of incandescent lamps, together with the number of volts pressure at which they are made to work.

A 1 candle-power lamp is made to work with a pressure of from 2 to 8 volts.

2½	do.	do.	5, 25 and 28	„
5	do.	do.	10, 22, 28 and 35	„
8	do.	do.	15, 20, 25, 45, 55, 100, 110 and 120	„
10	do.	do.	60, 70, 100 and 120	„
16	do.	do.	20, 25, 30, 45, 55, 60, 70, 100, 105, 110 and 120	„
25	do.	do.	20, 40, 45, 55, 60, 70, 100, 105, 110 and 120	„
32	do.	do.	30, 50, 55, 105 and 120	„
35	do.	do.	60, 70, 100 and 120	„
50	do.	do.	30, 50, 80, 105 and 120	„
100	do.	do.	50, 80, 105 and 110	„
150	do.	do.	50 and 110	„
200	do.	do.	50, 80, 105 and 110	„
300	do.	do.	50 and 110	„
400	do.	do.	50 and 110	„
500	do.	do.	80 and 105	„
800	do.	do.	80 and 110	„
1000	do.	do.	80, 105 and 110	„

Lamps to work with 100 and 110 volts pressure are more usually employed in private buildings, but in no case should a lamp be employed where the voltage is greater than the capacity of the lamp, as it will materially diminish the life of the lamp.

A 16 candle-power lamp will light from 60 to 100 square feet of floor space.



An "Arc" lamp has two candles of carbon almost touching, but free to the external air. This form of lamp is chiefly employed for street lighting and will not be further mentioned.

The term "Ohm" implies a measure of resistance to the electric current in the metal forming the wire.

"Conductivity" means the suitability of the metal forming the wire for conducting the current with a least amount of resistance. There is less resistance to the current flowing along a larger wire than in a smaller wire, but the further the current has to flow away from the source the greater will be the resistance.

A Megohm is a defined number of ohms resistance.

E.M.F. stands for Electro-Motive Force, that is, the pressure at which the current flows along the wire; the pressure intensity of this force is measured in volts. The difference of Potential means the difference of pressure between the ends of a circuit.

In high-tension mains the current flows along with great force; in low-tension mains the current flows with a small force.

An Ampère is a measure of the electric current strength flowing.

A Volt is a measure of the intensity of the pressure of the current.

A Watt is the product of one ampère multiplied by one volt; a watt is therefore a measure of electric energy.

C.P. stands for candle-power.

A 16 c.p. lamp requires 0·6 ampères of current at a pressure of 100 volts to give it light, or, in other words, it requires 60 Watts (that is 0·6 ampères × 100 volts = 60 watts) of electric energy, which is equal to about 4 Watts per candle-power.

A Board of Trade "Unit" of electric energy is 1000 watt hours, that is, it is equal to the product of the current in ampères × the pressure in volts × the hours, which together will give a result of 1000. Thus sixteen (or more correctly sixteen and a half) 16 c.p. lamps will require one Board of Trade "unit" in one hour in giving them proper light (that is, taking the current at 0·6 ampères per one 16 c.p. lamp at a pressure of 100 volts for one hour, multiplied by sixteen lamps, or $0{\cdot}6 \times 100 \times 1 \times 16 = 960$, which might be called 1000). Therefore one 16 c.p. lamp will burn for about $16\frac{1}{2}$ hours at the expenditure of one Board of Trade unit.

The insulation resistance of a wire means the effectiveness of the covering to resist the escape of the current from the wire along which it flows. This resistance is measured by megohms.

A Cut-out (or Safety fuse) is a piece of lead or tin wire which is used in joining conductors together, but offering a higher resistance to the electric current than the capacity of the conductors themselves. Thus, if a wire at A will take a certain current without getting overheated, but the wire B will not take the same amount of current without getting overheated, then the fuse at F is of such a size that it will fuse or burn through without allowing the current to be transmitted on to B. Of course the fuse F is necessarily fixed upon an incombustible base. Fuses should be of such size that they will fuse should there be 50 per cent. more than the maximum current the wires have been arranged to take. Cut-outs are made in 1, 5, 10, 20, 30, 50, 75, 100, 200 and 500 ampère sizes.

A "Pole" may be taken as referring to an undefined point at any part of a wire, and it requires the negative and positive poles of the wires to be connected at that point where light is required before current will flow and light be obtained. The positive pole is on the wire leading from the positive terminal, the negative pole being on that returning to the negative terminal. The Terminals are the junctions of the wires with the source of supply.

A Switch is a movable connection between the positive and negative poles of the wires, so that when the switch is "off" the poles are disconnected, and consequently the current cannot flow; but when the switch is "on," the wires are connected and allow the current to flow. The office, therefore, of a switch is to turn the current on or off to the lamps in a building. A switch should always have a fuse connected on it. Switches are made in sizes of 1, 3, 5, 6, 8, 10, 12, 25, 50, 80 and 100 ampères, and advancing in fifties from 100 to 1000 ampères, but they can be made to any size required. A Single-Pole Switch severs or connects the one (positive) pole (wire) only; a Double-Pole Switch severs or connects the two (positive and negative) poles (wires). Switches may be single-break or double-break, that is, they may sever each of the poles either at one or two points. Main switches are always double-pole, and may be either single- or double-break. Small switches, such as to the lamps, are generally single-pole, single-break. A Master Switch is a large switch used to control generally all the lights in one room, and is usually placed near the door.

Wall and Floor sockets are fittings into which the wires attached to movable lamps may be inserted for obtaining light.

A Meter registers in Board of Trade "units" the amount of electricity supplied.

A "Transformer or Converter" transforms the current from a high tension (pressure) down to a lower tension.

A "Main Switch" is a fitting which cuts off the current from going to any of the lamps.

A "Main Switchboard" has several switches on it which cut off the current from going to the various Distributing Boards.

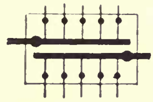
A "Distributing Switchboard" has a switch on it which cuts off the current from going to any of the lamps supplied from that board.

A "Circuit" may be taken as including all the wires and lamps between the terminals of its course. Under the "distributing board" system, the arrangement of the wiring to the various parts of a building is divided up into small circuits, each of which should not exceed a carrying capacity of more than 10 ampères of current, but 5 ampères is considered a more satisfactory maximum.

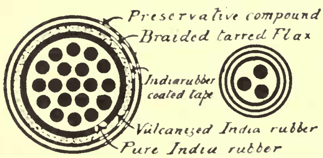
In each circuit there are the three points to be considered for the efficiency of the lighting:—

1st. The resistance to the current in the wire, which is designated by "Ohms."
2nd. The E.M.F. (electro-motive force), or pressure of the flow of the current, which is registered in "Volts."
3rd. The strength of the current flowing, which is measured in "Ampères."

A Fuse Board is a fitting supplied with separate fuses on it to each of the various circuits for protection against the overheating of the wires.



Cables (or wires) are made up of 3, 7, 19, 37 and 61 strands (wires) of Nos. 25, 23, 22, 21½, 20½, 20, 19, 18, 17, 16, 15, 14, 13 and 12 B.W.G. wire; the carrying capacity of the cables (or wires) being distinguished by the number of strands of a certain B.W.G. wire; thus, a 3/22 cable or wire means three wires of 22 B.W.G. wire.



Owing to the high conductivity of copper (that is, the small amount of resistance offered to the current), cables and wires are always formed of this metal.

Here follows a table showing the approximate greatest capacity of various cables suitable for carrying the current required for lighting the greatest number of 16 c.p. 100 volt incandescent lamps at a farthest distance (at the safe working current density of 1000 ampères per square inch of section of the wire), so that the fall of potential at the farthest point does not exceed 2 volts (this fall in the voltage will not materially diminish the brilliancy of the light). Each lamp taking 0·6 ampères of current at 100 volts pressure, which is equal to 60 watts of electric energy.

If 8 to 10 c.p. lamps be employed, then the cables will serve twice the number of lamps as those given for the 16 c.p. lamps.

If the cables be run only half the distance with the same greatest number of lamps, then the fall of potential would be 1 volt only instead of 2 volts.

Size of Cable or Wire in B.W.G. Wire.	Approximate number of ampères each cable or wire will carry at the safe working current density of 1000 ampères per square inch of section.	Approximate number of 16 c.p. 100 volt lamps each cable or wire will take at 100 volts pressure, allowing 0·6 ampères of current per lamp (that is, 60 watts of electric energy per lamp, or 4 watts per candle-power).
$\frac{3}{22}$	1·8	2
$\frac{7}{23}$	3·2	5
$\frac{7}{22}$	4·4	6
$\frac{7}{20}$	7·1	10
$\frac{7}{19}$	8·8	13
$\frac{7}{18}$	12·7	20
$\frac{7}{17}$	17·2	27
$\frac{7}{16}$	22·5	33
$\frac{7}{15}$	28·5	45
$\frac{7}{14}$	35·2	55
$\frac{19}{18}$	34·5	53
$\frac{19}{17}$	46·5	74
$\frac{19}{16}$	61·2	90
$\frac{19}{15}$	77·5	123
$\frac{19}{14}$	97·3	150
$\frac{19}{13}$	126·0	195
$\frac{19}{12}$	162·0	240
$\frac{37}{16}$	120·0	190
$\frac{37}{15}$	152·0	235
$\frac{37}{14}$	190·5	275
$\frac{37}{13}$	250·0	393
$\frac{37}{12}$	320·0	500
$\frac{61}{14}$	305·0	476
$\frac{61}{13}$	435·6	680
$\frac{61}{12}$	518·5	810

Each of the above cables and wires accommodating the above stated number of lamps may be taken for a distance of 80 yards (that is, 40 yards each way, lead and return) when the fall of potential at the farthest point will not exceed 2 volts. If a greater distance be required to be run with the same number of lamps, and no greater fall of potential than 2 volts, then a larger cable must be selected. Thus, if a cable be loaded to 500 ampères per square inch instead of 1000 ampères per square inch (or in other words by employing only half the above stated number of lamps on the cable in question), then the cables may be run for a distance of 160 yards instead of 80 yards, with the same fall of potential of only 2 volts.

The sizes of the cables in the foregoing list mostly in actual use are:—3/22, 7/22, 7/20, 7/18, 7/16, 7/14, 19/18, 19/16, 19/14, 19/12, 37/16, 37/14, 37/12, 61/14, 61/12.

It is always well to specify larger main cables than necessary, so as to allow for possible additional lights in the future.

Here follows a specification for electric lighting.

SPECIFICATION OF CABLING AND WIRING FOR ELECTRIC LIGHTING with Incandescent Lamps to (give address) for (give name and address of Employer) under the superintendence of (give name and address of Architect).

January 1904.

Fittings and lamps not included.

(1)—Note.—The lamps and fittings are not included in this contract.

It is always better to let the contract for the fittings and lamps separately, as they vary so greatly in price and design.

The lamp fittings most commonly in use are:—

The Drop Pendant—this fitting is suitable for rooms and passages generally, being dropped down from the ceiling at a fixed height.

The Adjustable Pendant—this fitting is more suitable for positions over tables, it is similar to the drop pendant, but can be adjusted to various heights. There is another form of adjustable pendant suitable for dressing-tables, in this case the lamp shade can in addition be adjusted to any angle. In best bedrooms two of these pendants should be fixed, one on either side of the looking-glass.

The Wall Bracket—this fitting is suitable for any position similar to a gas bracket.

Portable Lamps—these are useful for reading tables, or placing in any movable position in a room. When light is required the wires connected to the lamp have to be fixed for the time being either into a wall or floor socket.

Number of points.

(2)—The contract includes a complete system of cabling and wiring for electric light to (say) 130 points.

It is always well to describe the wiring to a certain number of points, and not for a certain number of lamps, as any one point may be finished with several lamps.

Materials and workmanship.

(3)—The materials and workmanship to be of the best character. The contractor is to include all labour, material, expenses, superintendence, cables, wires, conductors, leads, branches, casings, main cut-out, main switch, main switchboard, distributing switchboards, sub-distributing switchboards, fuse boards, cut-outs, switches, ceiling plates, wall and floor sockets with fuse in detachable portion, transformer (converter) and meter. The terms, cables, wires, wiring, branches, conductors and leads, are to be understood as being synonymous words.

Cutting away and making good.

(4)—Perform all excavating, filling in, cutting away, making good, lifting and relaying floors, and painting and decorating to match the adjoining work both to the casings and roses and to the work disturbed. The making good to the plastering is to be done in Parian cement and painted one coat before it dries (if finished with paint).

When the wiring applies to a building in course of erection, this clause would be modified, as the decoration and similar work would be done by the builder; but in the building contract do not omit to state what has to be done to the electrical engineer's work. See Preliminary Items, clause No. 25; and Painter, clause No. 55a.

Position of casings and wires.

(5)—The casings where practicable are to be fixed on the surface, except where crossing floors. In the best rooms they are to be chased and hidden in the walls, and in all cases placed in positions where they are not liable to dampness or injury. Where the wiring goes under the floors, the boards are to be screwed with brass countersunk screws, and where fuses or similar fittings are hidden, hinged access traps are to be formed for inspection. Where the wiring goes through the walls the casings are to be placed in porcelain tubes.

State in what positions the casings are to be hidden in the walls. Where bedded in walls, or where liable to rough usage, the wires may be laid in plain or galvanised iron tubing. When buried in the ground galvanised iron tubing should always be used, and laid in an 1 in. rough deal trough filled with pitch.

To satisfaction of Supply Co. and Fire Office.

(6)—The work to be carried out in accordance with the rules, regulations and requirements of the Company supplying the electric current, as well as those of the Fire Office insuring the building and furniture, and the work is to pass the survey of their respective inspectors.

Alterations.

(7)—The architect may alter the position of any point without extra charge being made, provided that such alteration does not necessitate the work being done twice.

Thus, if a point be described to one part of a room it may be altered to another part without extra charge, provided it has not already been put in.

Class of switch and other boards.

(8)—The main switchboard, distributing switchboards, sub-distributing switchboards, cut-out or fuse boards to be of slate, enamelled on front and back, with the positive and negative portions insulated from each other. The slates to be mounted and framed in oak (mahogany or teak), with similar wood doors glazed with plate glass, and provided with lever locks and two keys to each. The holding screws to be insulated by ebonite rings and collars. Each of the switchboards to have a cut-out and switch on the positive pole, and a cut-out only on the negative pole; all connections being arranged on the front of the boards with safety fuses and brass omnibus bars.

Additional cut-outs to be placed at points where there is a change in the section of the wires, the fuses being mounted on incombustible porcelain bases with porcelain covers.

All distributing and fuse boards to have two spare ways on them for future additions.

The main switchboard, the distributing switchboards, the sub-distributing switchboards, the fuse boards and the main cut-outs to be labelled in ivory, with a reference list of the lights they control.

Class of conductors and insulators.

(9)—All conductors to be of stranded copper wire of not less than 98 per cent. high conductivity (Matthiesen's standard of pure copper), and tinned before stranding; and insulated with pure india-rubber, then with vulcanised india-rubber, then with india-rubber coated tape, and the whole vulcanised together and finished with braided tarred flax and coated with preservative compound. The insulation resistance of the main conductors to be not lower than 600 megohms per mile, the branch cables 300 megohms, and all cables where liable to damp 750 (or 1000) megohms when tested in water after twenty-four hours' immersion at 60° Fahr, after one minute's electrification. The character of the insulation to be equal to Q (or K and S) Silvertown manufacture (or No. 42 class Glover's manufacture).

See the sketch of cables on page 515.

Joints.

(10)—If joints be absolutely necessary, they are to be soldered together, resin only being used as the flux, and then insulated with pure and prepared rubbers, and afterwards vulcanised and taped with rubber-coated tape.

Bunching of conductors. (**11**)—There is to be no bunching of conductors.

Conductors of different colours. (**12**)—The positive and negative conductors to be coloured black and red respectively, and placed in separate grooves in the casings, each conductor being in a separate groove. The positive leads to be placed in the left-hand groove, and the negative returns in the right; and where inclined to a horizontal position, then the positive leads to be below with the negative returns above.

Least size of wires. (**13**)—The smallest wire used to be 3/22, but where from convenience of wiring separate cut-outs are not put in, then 7/23 wires must be taken up to each point; but two 16 c.p. points may be connected on to a 3/22 wire provided they are looped in, and similarly three 16 c.p. points may be connected to a 7/23 wire.

The wires in the pendants and other fittings will probably be of a smaller section.

Small circuits. (**14**)—The conductors from the sub-distributing and fuse boards to be divided into small circuits, each circuit carrying not more than 5 ampères (that is about equal to eight 16 c.p. 100 volt lamps or their equivalent).

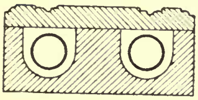
Current density and carrying capacity of wires. (**15**)—The wiring to be suitable for 100 volt lamps. The current density is not to exceed 750 (or 850) ampères per square inch of section in the main and principal branch conductors, and not more than 900 (or 1000) ampères in the smaller conductors. The carrying capacity to be such that, when all the lamps are alight, the fall in E.M.F. between the meter and the farthest lamp on any circuit is not to exceed 2 volts.

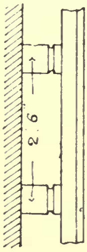
Under the Board of Trade regulations the voltage in private dwellings is not to exceed 200 volts. The voltage at the mains in the streets are run up to some 10,000 to 20,000 volts, and reduced down by a transformer (converter) to 100 volts in the buildings. Possibly the Board of Trade may allow private dwellings to be supplied at a greater voltage than 200 volts, say up to 350 volts, when in such case this clause must be modified accordingly.

Separate switches to each point. (**16**)—Each point to have a separate switch, but certain points to have two switches, as hereinafter mentioned.

Floor and wall sockets are not always provided with a switch, as they are used for attaching temporarily reading lamps and other movable fittings by merely placing one end of the cord of the lamp into the socket in question.

Casings.





(**17**)—The casings to be of well-seasoned American white wood, grooved out for the cables and wires (conductors). Casings carrying the main conductors to have fillets 1 in. wide separating the grooves, those carrying the principal branch conductors to have fillets $\frac{3}{4}$ in. wide, and those carrying the smaller branches to have fillets $\frac{1}{2}$ in. wide. The covers to be screwed to the casings with brass screws, and the casings screwed with brass screws to plugs in the walls or to the other fixings. Casings and covers to be painted over entirely, both inside and out, with two coats of fireproof paint (or shellac) before fixing. All corners to be half lapped or butted, and the cappings mitred. The casings and cappings to be of an ornamental character where not hidden, and of special design in positions where the architect may require, in order to harmonise with the surrounding work. In surface work against damp walls the casings are to be kept $\frac{3}{4}$ in. away with porcelain insulators every 2 ft. 3 in. apart.

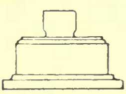
Casings are made from $1\frac{1}{2}$ in. to 6 in. wide, with fillets between the grooves from $\frac{1}{2}$ in. to 2 in. wide.

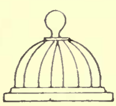
Here are some sizes of casings suitable for various cables:—

Size of Cables in B.W.G. Wire.	Total Width of Casing.	Size of each Groove.	Width of Fillet between Grooves.
	in.	in.	in.
$\frac{7}{20}$	$1\frac{3}{4}$	$\frac{5}{16}$	$\frac{3}{4}$
$\frac{7}{18}$	2	$\frac{3}{8}$	1
$\frac{7}{16}$	$2\frac{1}{2}$	$\frac{1}{2}$	1
$\frac{7}{14}$	3	$\frac{5}{8}$	1
$\frac{19}{16}$	$3\frac{1}{2}$	$\frac{3}{4}$	$1\frac{1}{4}$
$\frac{19}{14}$	4	$\frac{7}{8}$	$1\frac{1}{2}$
$\frac{19}{12}$	$4\frac{1}{2}$	1	$1\frac{1}{2}$

Class of switches.

(**18**)—Switches to be of the quick make-and-break type, so that they do not rest in any position between "on" and "off." They are to be mounted on incombustible porcelain bases upon wood blocks (or in some positions they may be upon ornamental oak or teak roses). The cases and handles to be in ivory porcelain in all positions except basement, cellars and top floor, where they are to be of brass tumbler make.





Cases and handles to switches may be very elaborate, either in brass, ivory or wood. Porcelain cases with ivory handles make very neat work for principal positions.

Class of ceiling plates.

(**19**)—Ceiling plates to have incombustible porcelain bases with separate cut-outs on the one pole, and fitted with ivory porcelain covers and cord grips.

Samples of materials. (**20**)—Samples of all switch, distributing and fuse boards, casings, cables, wires, conductors, switches, cut-outs, ceiling roses, blocks, wall and floor plugs, fuses and all other fittings to be approved by the architect before fixing.

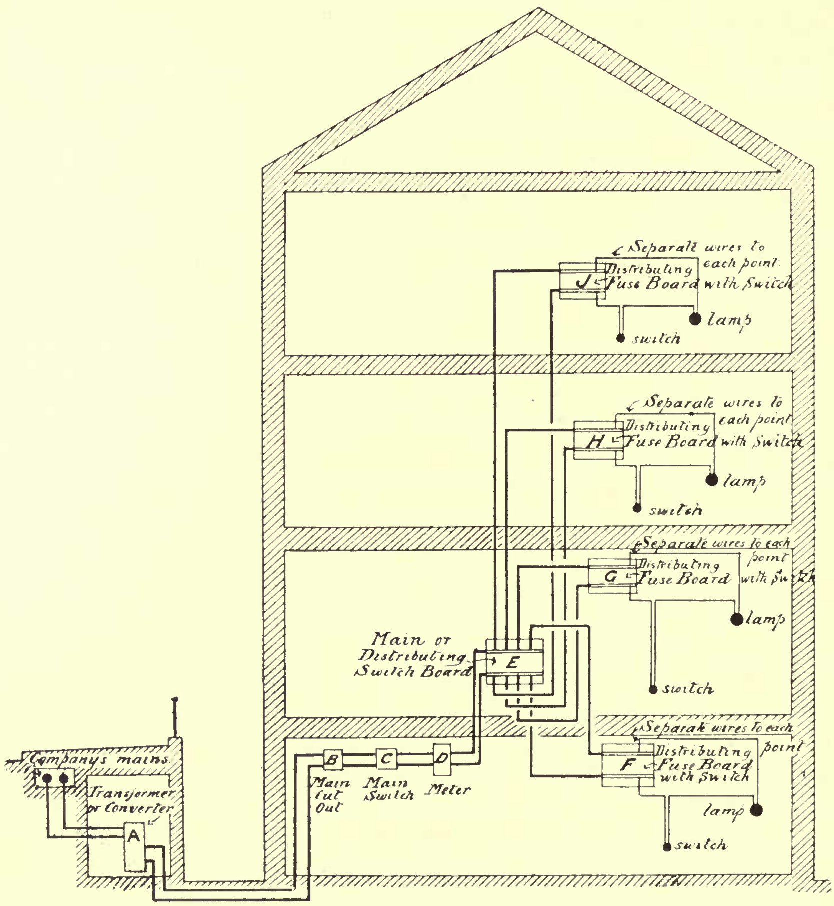
Fusing point of fuses. (**21**)—The fuses are to melt at 50 per cent. more current than the capacity of the wires have been designed to take. All fuses to be accessible.

Lamps. (**22**)—When the contract includes lamps, here is a description:—

The incandescent lamps to be a certain manufacturer's make, fitted with brass collars. The lamp holders to be of the bayonet socket type with spring plungers, mounted on porcelain bases.

State the candle-power and voltage of the lamps.

Testing. (**23**)—Test all wires before the cut-outs, fuses, switches or fittings are put in.



The above is a sketch showing the wiring of a house upon the distributing board system, to the particulars of which the following pages refer.

The following is a schedule of the arrangement of the wiring to the various points, the total number of points being taken at 130, divided up as follows:—Basement, 27 points; ground floor, 62; first floor, 27; second floor and roof, 14.

The cables from the converter A to the main or distributing switchboard E have to supply current to 130 points (each point being taken as equal to one 16 c.p. 100 volt lamp), and allowing for an increase of say 20 more lamps which may be required at some future time, it will make the number of points ultimately to be supplied at 150. Then looking at the table on page 516, one hundred and fifty 16 c.p. lamps will be found opposite the cable 19/14, therefore these mains will require to be 19/14.

Again, the cables from the main switchboard E to the distributing fuse board F in the basement have to take 27 lamps, and allowing for 3 lamps extra, this would make 30 lamps; looking again at the table on page 516, opposite (say) 33 lamps will be found a cable 7/16, which will be the size required.

In like manner the cables from the main switchboard E to the distributing fuse board G on the ground floor have to take 62 lamps, and allowing 12 lamps extra would equal 74 lamps, opposite which in the table will be found the cable 19/17, being the size suitable for this number of lamps.

Further, the cables from the main switchboard E to the distributing fuse boards H and J on the first and second floors have to take 27 and 14 lamps respectively, and say with three extra lamps on the first floor, would be equal to 30 and 14 lamps, opposite which (say 33 and 13) will be found the cables 7/16 and 7/19, being the sizes required.

It must not be forgotten that the table on page 516 shows the suitable number of lamps for a distance of 40 yards each way, with a fall of potential of 2 volts; if the distance be greater, then read the notes at the foot of that table.

Notice to Supply Co.

(**24**)—Give notice to Electric Supply Co., and pay their fees and expenses for connecting to their mains and bringing in their supply mains in galvanised iron tubes, and attaching to a transformer (converter) A fixed in the cellar in a fireproof chamber (or in an iron wire grille case), for a supply of E.M.F. of 100 volts to 150 16 c.p. lamps.

Mains.

Carry on a pair of 19/14 mains from converter A to main switchboard E placed in hall on ground floor, with a meter at D, a main double-pole, single-break switch at C in case, and a main double-pole cut-out at B fixed in basement passage near the entrance.

The main switchboard E to have a double-pole, single-break main switch to cut off all the circuits.

Take (say) four separate circuits, consisting of separate pairs of mains to the four distributing fuse boards F, G, H and J. Each of the distributing fuse boards to have a double-pole, single-break switch for controlling all the lights supplied from each board (that is, the branch circuits to any various sub-distributing fuse boards with their points).

The following are the sizes of the mains to these four circuits:—

Take a pair of 7/16 mains from main switchboard E to the distributing fuse board F in basement.

Take a pair of 19/17 mains from main switchboard E to distributing fuse board G on ground floor.

Take a pair of 7/16 mains from main switchboard E to distributing fuse board H on first floor.

Take a pair of 7/19 mains from main switchboard E to distributing fuse board J on second floor.

Basement points. Take from distributing fuse board F in basement separate pairs of 3/22 wires to the following points:—

	No. of 3/22 points.
Entrance lobby, for 1 pendant point . .	1
Passages, 6 brackets or pendants . .	6
Kitchen, 2 pendants and 2 brackets . .	4
Scullery, 1 bracket and 1 pendant . .	2
Servants' hall, 2 pendants	2
Butler's pantry, 1 bracket and 1 pendant .	2
Housekeeper's room, 1 pendant and 2 brackets	3
Larder, 1 pendant	1
Cellars, 5 brackets or pendants . . .	5
W.C., 1 bracket	1
	27

Mention any other positions required. If the kitchen have a skylight the pendants over the table should be dropped down from a metal tube running across the skylight under the blind, see Gasfitter, notes to clause No. 8, and the sketch on page 182.

The pendant and bracket points may be altered to suit the circumstances of the case. A swing bracket is very useful over a kitchen range or hot plate.

Ground floor points. Take from distributing fuse board G on ground floor separate pairs of 3/22 wires to the following points:—

	No. of 3/22 points.
Vestibule, for 1 pendant point . . .	1
Hall, 1 pendant and 2 brackets . . .	3
Lavatory and w.c., 2 brackets . . .	2
Dining-room, take a pair of 7/22 wires to 1 pendant for 6 lights, and 3/22 pairs of wires to 2 wall sockets. The centre pendant to have 2 switches, each controlling 3 lights . . . (say equal to)	8

	No. of 3/22 points.
Drawing-room, 6 brackets, 3 wall and 3 floor sockets	12
Library, 4 brackets and 2 wall sockets .	6
Passages, 6 brackets	6
Billiard-room, take a pair of 7/18 wires to 1 pendant for 18 lights (say equal to)	18
Put separate master switches outside the drawing-room and dining-room doors to control all the lights in each room excepting one.	
Entrance gate lamps, take separate pairs of 7/23 wires in galvanised iron tubes to each gate lamp for 3 lights each (say equal to)	6
	62

Mention any other points required.

If there be a large lantern light over the main staircase, with a pendant carrying 6, 8 or 12 lights, then it should have two switches fixed in the hall below, each switch controlling half the lights. The mains to this pendant should be 7/20 wires if for say 8 lights.

First floor points. Take from distributing fuse board H on first floor separate pairs of 3/22 wires to the following points:—

	No. of 3/22 points.
Each of the six bedrooms for, say, 1 pendant and 1 wall socket	12
Boudoir, 4 brackets, 2 wall and 1 floor socket	7
Bath-room, 1 pendant	1
W.C., 1 pendant.	1
Passages and landings, 6 pendants or brackets	6
	27

Put a master switch to control all the lights in boudoir excepting one.

Mention any other points required.

Second floor and roof points. Take from distributing fuse board J on second floor separate pairs of 3/22 wires to the following points:—

	No. of 3/22 points.
Each of the six bedrooms for, say, 1 pendant	6
Bath-room, 1 pendant	1
W.C., 1 pendant.	1
Passages and landings, 5 brackets or pendants	5
Over cistern in roof, 1 pendant	1
	14

Mention any other points required.

If a room be somewhat large and many points be required, it is better to take a separate pair of mains from the distributing fuse board on that floor to a sub-distributing fuse board near the room in question, and from thence to each of the several points, instead of running the wires all back to the distributing fuse board, which may be some distance away.

Switches are generally placed near the door entering a room.

The exact position of the main switchboard, the distributing fuse boards and the sub-distributing fuse boards may be stated; they are generally fixed in the passages or halls.

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