

Part II.

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The Mechanics of Hardware.

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## Section I.

### A Lock Primer.

**B**ROADLY speaking a lock is a *bolt* guarded by an *obstacle* and controlled by a *key*.

The *Bolt* usually slides, but may be pivoted or rotary.

The *Key* usually rotates, but may act by sliding or pushing.

The *Obstacle* which must be overcome by the key to operate the bolt, may be of either of the following types, viz.:

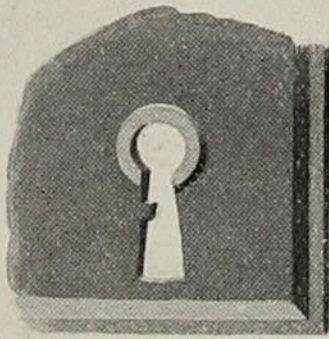


Fig. 1.

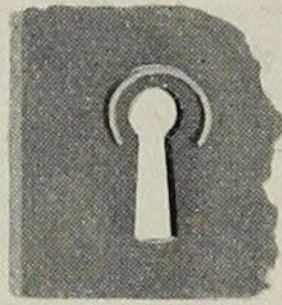


Fig. 2.

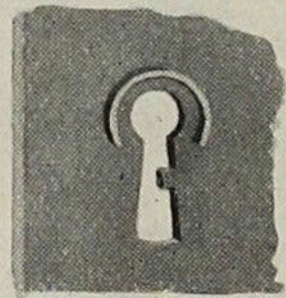


Fig. 3.

Forms of Wards.

*Warded* Type, (Figs. 1, 2 and 3), in which the obstacle consists of fixed “wards” within the lock, which interfere with the movement of the key unless it has grooves or perforations coinciding with the wards;

or *Tumbler* Type, (Fig. 4), in which the obstacle consists of one or more movable “tumblers,” which prevent movement of the bolt until they are moved into a certain position by the proper key.

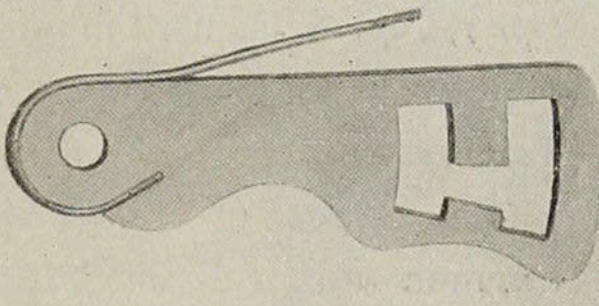


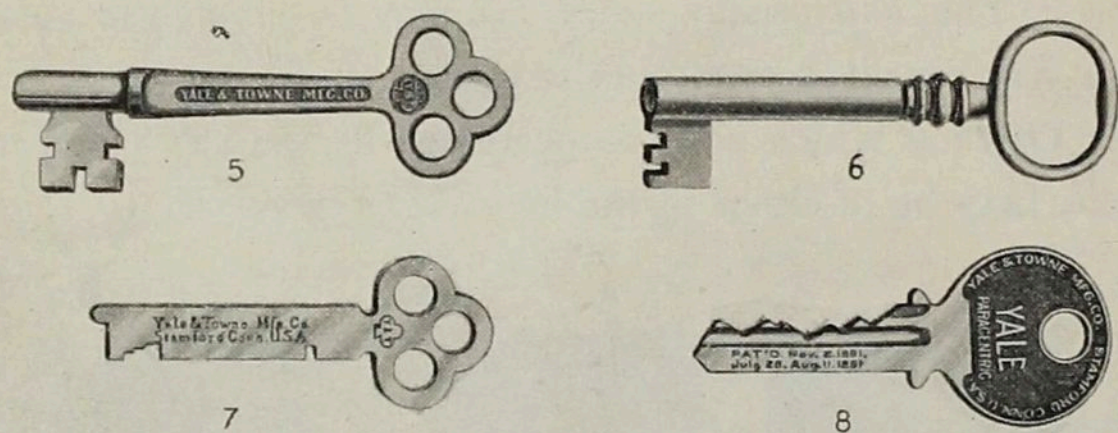
Fig 4.  
Lever Tumbler.

tion by the proper key.

All locks are built up out of these elements.

The element which chiefly determines the character of a lock is the *obstacle*, that is, the type of obstruction which the key must overcome to actuate the bolt; and this in turn largely influences the form of the key.

The four types of key most commonly used are the following, viz :



*Round Key*, (Fig 5), with solid cylindrical shank and stem, and with a wing bit.

*Barrel Key*, (Fig. 6), a round key with a tubular end, the hole in which fits over a guide-pin in the lock.

*Flat Key*, (Fig. 7), originally of the Yale type, but now commonly used (in combination with a revolving centre or disc) with locks of both the warded or lever-tumbler types.

*Cylinder Lock Key*, (*Yale type*), Fig. 8, as used in pin-tumbler locks made on the Yale system.

The types of Locks in common use, classified by the element of the "obstacle," are as follows, viz :

*Warded Locks*; (Fig. 9),

this construction is usually employed only in the cheapest grades

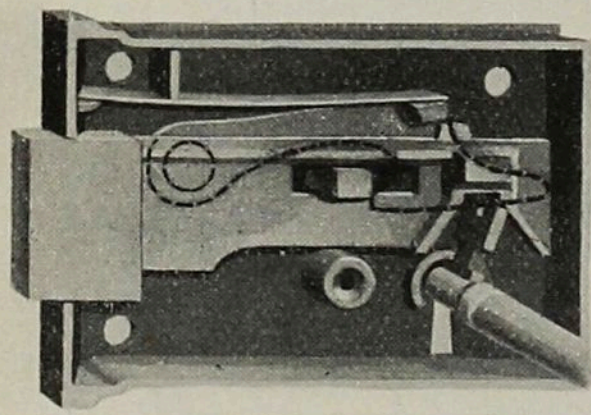
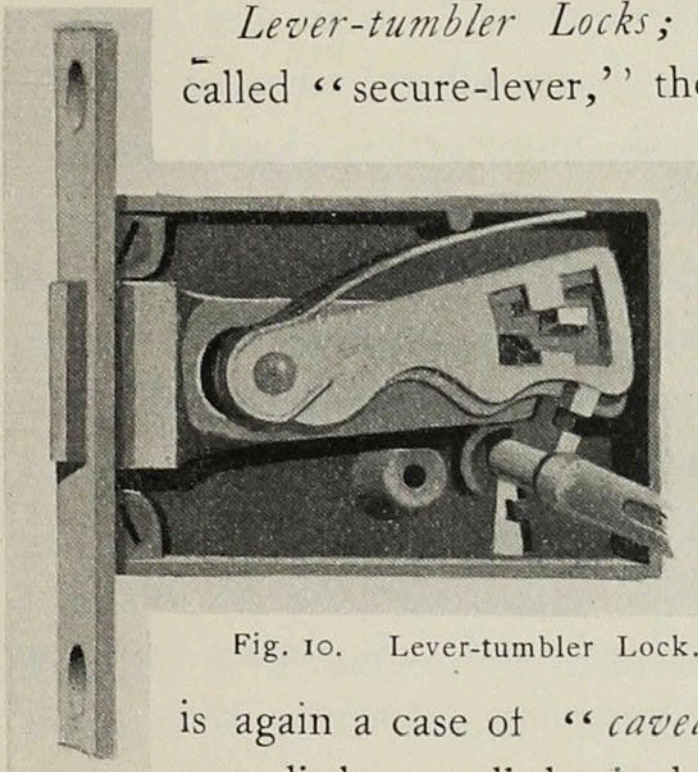


Fig. 9. Warded Lock.

of locks, and, as so used, affords the minimum degree of security. As the term "warded lock" would call attention to these facts it is little used in the trade, and the rule "*caveat emptor*" applies. Most warded locks have a "back spring" or dog, the feeling of which, when using the key, resembles that of a tumbler, but which adds nothing to the security. Locks selected because *cheap* will usually be found to be of this type. Round, Barrel and Flat keys are all used with warded locks.



*Lever-tumbler Locks*; (Fig. 10), in this type, also called "secure-lever," the degree of security is measured by the kind and number of tumblers, and covers a very wide range. A one-tumbler lock has little or no more security than a warded lock, and as attention is not often called to the fact that, although a "tumbler lock" it has only *one* tumbler, it is again a case of "*caveat emptor.*" The buyer who pays little gets little, in locks as in other things.

With two or three tumblers, however, the degree of security increases rapidly, almost in a geometrical ratio to the number of tumblers, so that such locks become suitable for a large number of uses. With Builders' Locks even of this grade, however, the number of key changes is usually limited to 12 or 24, occasionally rising to 36 and in a few cases to 72, so that careful selection is needed where greater security against interchange of keys is desired. A good three-tumbler Builders' Lock, of the lever-tumbler type, should be capable of from 200 to 500 key-changes, and such locks can always be had if called for, but of course at higher cost.

In selecting locks for any purpose the *number of changes* should always be investigated, as it affords a reliable clew to the security and quality of the lock. Round, Barrel and Flat keys are all used with lever-tumbler locks.

*Cylinder Locks (Yale type)*; this system of lock construction is fully described in Part 1, Section 5. It affords the highest degree of security and, with the five pin-tumblers usually employed, a vast number of key-changes.

Under the generic name of "cylinder" locks they are now made by many manufacturers, all of whom have copied the original prototype, the Yale lock, more or less closely, excepting, of course, the Paracentric key and other features which are still protected by patents. As little or no difference in cost exists, however, preference may safely be given to the original, rather than to any copy, however close, especially as in this way the buyer is assured of the benefit of every latest improvement.\* Flat, Grooved, Corrugated and Paracentric keys are used with cylinder locks.

All Builders' Locks, Cabinet Locks and Padlocks are based on various combinations of the foregoing elements, their other variations relating merely to size or to uses.

The forms of Builders' Locks which architects most frequently require are the following, fuller definitions of which may be found in the Glossary, viz.:

*Front Door Locks and Vestibule Latches*; for entrance doors.

*Two-Bolt Knob Locks*; for room, communicating and closet doors.

\*In this connection the following true story (even if slightly *infra dignitate*) may be permitted. In response to a demand arising from a new type of building a certain new form of Yale Lock was designed and put on the market. A mistake was made in the first lot of iron castings, but, as quick delivery was urged, time was saved by cutting out a certain "stump" (which was wrongly located) and riveting in a brass substitute in the proper position. An alert competitor promptly reproduced the lock, *in ipso forma*, patch included! No apparent reason for the patch appeared, but being in a Yale Lock, it was copied, thus repeating the incident of the traditional Chinese tailor, who being commissioned to duplicate a European coat did it so conscientiously as to include all the patches.

*Three-Bolt Knob Locks*; for bedroom and bath room doors.

*Sliding Door Locks*; for all kinds of sliding doors.

*Knob Latches*; where a knob action only is required.

*Dead Locks*; where a key action only is required.

*Night Latches*; where a spring lock, with key, is required.

*Hotel Locks*; for bedroom doors, in series controlled by a master-key.

*Office Locks*; for office doors, in series controlled by a master-key.

*Store Door Locks*; for entrance doors of stores, etc.

Each of these is made in many sizes and styles, with various kinds of keys and in many qualities, which latter are closely indicated by the price; so that specifications which do not specify by catalogue number, or by a very complete description, leave an open door for the use of the cheapest lock of the general kind called for.

To secure the best result for a given expenditure either the locks should be omitted from specifications and selected by the architect or owner, or, if included, should be carefully selected and then specified exactly, preferably by the maker's name and numbers. Full information for this purpose is given in Part IX.

To select the proper lock for any door the latter should first correctly be classified, whereupon the available locks can then be found under the several designating names above indicated.

The degree of security required is determined by the purpose for which the lock is intended, and can be obtained by selecting a lock having the proper type of mechanism and key, according to the indications given in this section and elsewhere. It should be borne in mind, however, that, with locks as with other material, low price usually means low grade or quality, and that where medium or high quality is wanted locks of corresponding prices should be selected. Cheap locks have many legitimate

uses, but these rarely extend to work worthy of the professional architect, and the latter must guard against their intrusion where not wanted.

In selecting locks of higher grade and higher cost, however, he has equal assurance that he will obtain as good or *better*, value for his expenditure, competitive conditions having long since brought prices for locks of all grades to a basis which corresponds very closely to their relative cost of production. Therefore, for ordinary work the medium grades are usually the cheapest which should be considered, while for high class residence, commercial and public work the best are none too good, and their cost rarely, if ever, seriously greater.

In conclusion a few words may not be out of place as to new inventions. Few self-respecting professional "inventors" have felt their mission to be fulfilled until they have "invented" a lock of some kind. Apparently there is a fascination in the subject which they cannot resist, however complete their ignorance of the past achievements and present development of the art, and so each incontinently proceeds to "invent" things which, while new to his untutored mind, are usually already well-known, occasionally in successful use, but more frequently long since consigned to the limbo of useless and discarded schemes.

If the text of the "primer" has served its intended purpose it has shown that the essential elements of a lock are few in number and simple in kind. Practical success lies in adapting them skillfully to the intended purpose. In lock-making, as in other mechanic arts, this can usually best be done by those who possess the proper training, the best facilities and the broadest experience, and who have devoted their undivided attention and skill to the designing and making of *good locks*.



## Section 2.

### Lock Picking.

SO much misconception on this subject exists as to call for its discussion here. As stated elsewhere, no lock *having a key-hole* has ever been made or invented which is absolutely proof against picking, nor is it probable that one ever will or can be made.

The London International Exhibition of 1851 was the scene of the greatest lock picking contest which ever occurred, and its interesting story is told from the English side by George Price,\* and from the American side by its champion, A. C. Hobbs.† The latter, an American with an extraordinary sense of touch, had gone to London as the representative of a then celebrated bank lock, now long forgotten, and was led to attempt the picking of the leading English bank lock of that day by the reward which had long been offered to anyone who could do so.

He succeeded in this, and great public interest was aroused by the controversy which ensued, heightened by the international rivalry involved, even prominent bankers taking part and sides. Hobbs remained the victor, and subsequently established a business in London, which still flourishes under different ownership, based on a well-made lever-tumbler lock for general use (but containing no new features of special merit) which as the "Hobbs Lock," at once became popular because of the renown attaching to his name in consequence of the lock picking controversy of 1851 above referred to. Thus it happens that in

\* A Treatise on Fire and Thief-Proof Depositories and Locks and Keys. By George Price. London, 1856. Pages 532 to 582.

† In Transactions of The American Society of Mechanical Engineers, Vol. VI, Page 233.

England as well as in the United States the name of an American inventor is associated with the best known and most popular lock, that of Hobbs in the former and that of Yale in the latter.

Now the English locks picked by Hobbs (whom the author had the pleasure of knowing well in his latter years, which were spent in America and devoted to the management of a large works making ammunition for small arms) were Bank Locks, operated, as all such locks then were, by keys, but of intricate and expensive construction.

The Day & Newell so-called "parautoptic" lock, with which Mr. Hobbs had gone to England, a leading American bank lock, was also a key lock, and Mr. Yale, prompted by the London developments to study the subject, demonstrated soon afterwards that he could pick it, and thus shattered another reputation. But he also discovered that the instrument which he invented for this purpose, a micrometer, enabled him to pick his own best bank locks, all of which were key locks but exceedingly intricate, some of them costing as much as \$300. It was this fact which led him finally to discard all forms of locks with key holes for bank use, and to turn his attention to the combination or "dial" lock. In the form in which this stood at the time of his death, in 1868, it was supposed to be unpickable, but in the following year it was demonstrated to be pickable by Mr. James Sargent, maker of a competing bank lock of the "dial" type, whose own lock, however, was also shown to be vulnerable a little later.

Out of this recurrence of the "lock controversy" came a fuller knowledge and a perfecting of details which led up to the present type of Dial Lock, which, in its better forms, is absolutely unpickable by any means now known or which it is probable can ever be devised.

The great publicity given to the "lock controversy" in

England, and, in lesser degree, to the picking of the earlier forms of Dial Locks in America, stimulated public interest in locks of all kinds, and led to great activity in the United States in the invention of new varieties of Key Locks, especially in the period from 1870 to 1880. Most of these inventions had little or no merit, and soon disappeared. A few had merit, and for a time had some sale, but most of the good ones were of complicated construction, and if well made were expensive, or if cheaply made were unsatisfactory. The chief object sought in all was security against picking. As experience accumulated it became evident that practical security does not depend necessarily upon intricacy of construction, but can be obtained, in degree amply sufficient for all ordinary uses, by simpler, and therefore better, methods of design and construction. The final outcome has been the rejection by the public of "freak" locks of all kinds, and the acceptance of the three standard types explained elsewhere, viz: the "warded," the "lever-tumbler" and the "pin-tumbler."

Locks of the "pin-tumbler" type, that is those constructed on the "Yale" system, are now made by many manufacturers, all conforming in detail more or less closely to the methods of design and construction developed by the makers of the Yale Lock, but omitting, of course, recent improvements introduced by the latter and covered by patents still in force. Where departures from the original model have been made they have usually been intended either to cheapen the construction or to embody some novelty; in either case they have failed to constitute any improvement on the original, and the latter still represents the best and latest development of the art.

This somewhat long story has been told to emphasize the fact that no lock exists, operated by a key through a key-hole, which cannot be picked by the modern lock expert if given the neces-

sary time and tools, and that no such lock can truthfully be claimed to be pick-proof. But this statement implies no change of conditions and need cause no feeling of insecurity. On the contrary, users of locks are offered better security to-day than ever before, due above all to the advent of the Yale Lock and to its influence in raising the standard of design and workmanship in locks of all other grades.

Practically security is a relative term, and while no key lock is absolutely pick-proof some of them are so difficult to pick as to defy attack except by an expert, aided by all favoring conditions, and many others have sufficient security for the purposes for which they are used.

On the other hand, vast quantities of cheap locks are made which have such slight security as to offer little or no resistance to attack by the simplest tools, a few skeleton keys sufficing to open most of them, and in too many cases such locks are employed in places where security is really important, under the delusion that they furnish it. He who buys a cheap lock gets what he pays for and no more.

The method employed to pick a lock depends on its type. To pick a "warded" lock all that is required is an instrument which will clear the wards and which has an arm or bit on its end of a length which will engage with the bolt so as to move it. A pick of this kind can usually be made by simply bending a piece of stiff wire (such as telegraph wire) into a hook, a few trials sufficing to ascertain the necessary shape. Hence the insecurity of the common warded lock used on doors and on furniture. Its merit lies in its cheapness, but it should have no place where security is needed.

To pick a "lever-tumbler" the same simple instrument may be sufficient, if there is only *one* tumbler, but if the lock has several

tumblers another method and better instruments are usually necessary. In this case the method of picking consists in using one instrument to put retractive pressure on the bolt, and another to lift the several tumblers, one at a time. The application of pressure forces the "fence" or stump on the bolt against the tumblers. Practically one tumbler will always be found to bear first or harder than the others, and a delicate sense of touch will detect this difference through the picking tool, thus enabling that tumbler to be set so that its "gating" is in line with the "fence," whereupon it will hang or remain resting on the "fence" while the same operation is repeated to find the tumbler which next bears hardest, this process being continued until all of the tumblers are thus set, whereupon the pressure on the bolt will cause it to retract, the barrier to its motion having been overcome.

All "lever-tumbler" locks are susceptible to attack by this method, some being easy and others difficult to pick, according to their construction and number of tumblers. As a rule the difficulty increases rapidly with the increase in the number of tumblers. The same method is available in the case of cylinder locks, except that the pressure is applied to rotate the plug instead of to act directly on the bolt, but as such locks usually have five pin-tumblers, which are more difficult of access and are, or should be, more accurately fitted, the difficulty of picking is greatly increased and can only be overcome by an expert aided by the necessary instruments. The highest degree of security is attained by the Yale Paracentric Lock, in which the difficulties just referred to are greatly augmented (as explained in Part I, Section 5) by the interlocking barriers of the key-way which, projecting from either side beyond the axial line, so obstruct the key-way as to make the use of the picking instruments, even of the finest kind, exceedingly difficult, and rendering this lock unpickable

except by the most skillful expert equipped with special and very delicate tools. As against any attack to which it is exposed in actual use the Yale Paracentric Lock is practically pick-proof.

Safety against picking and high capacity for key-changes are the two elements which determine the degree of security which a lock affords, and both should be kept in mind when selecting locks for various uses. For some purposes a lock is needed merely to secure reasonable privacy, and in such cases high security is not called for, but for cash drawers, desks, wine closets, offices and especially for the street doors of stores, residences, etc., only locks having high security should be selected, and the difference in cost between these and those of inferior character is now so small as to leave no excuse for the use of insecure locks where the protection of person or property is the end in view.

## Section 3.

### The Grades of Builders' Locks.\*

#### COMMON GRADE.

**E**NORMOUS quantities of locks of the commoner and cheaper grades are, and always will be, made to meet the demand for such goods arising from the construction, in city and country, of buildings of the cheapest class, especially tenements and small houses, most of which, however, are built on speculation, or by direct contract with builders, and thus seldom come under the professional care of the architect. As cheapness is the controlling factor in such goods, quality diminishes accordingly, and often to the vanishing point. With locks of this class the architect has little concern, and a brief description of them will suffice.

For the cheapest work Rim locks are preferred, because requiring no "trim" except knobs, and still more, because much cheaper to apply than locks which require to be mortised into the door. They are made chiefly of cast iron, japan finish, but recently also of wrought steel, the latter usually being somewhat better, as for example in the case of the "Vulcan Jr." lock.

Such locks usually present a fair external appearance, and are worth the low prices at which sold. Their "cheapness" is chiefly internal, and is easily apparent on opening them, as should be done when making a selection. Those in which the bolts and tumblers (if any) are of brass or wrought steel should be given preference over those in which these parts are of cast iron, as the latter is more liable to break. There is considerable choice also in the styles of keys.

\*For detailed enumeration of locks of various grades see Part IX.

Cheap Mortise locks are also largely used, combined usually with the cheapest kinds of "trim," and the above remarks apply equally to them. The most objectionable are those with cast iron *fronts*, because of the liability to breakage of this part if made of a brittle material, and fronts of steel or bronze should be insisted on. The demarcation between poor and fairly good mortise locks is not well-defined, and thus it is not difficult to substitute the former for the latter when self-interest so prompts. The remedy lies in a careful selection, a definite specification and a subsequent close inspection. The difference in cost will be found so inconsiderable, however, between very poor and fairly good locks as to justify the use of those of a "medium" grade for nearly every minor purpose covered by the work of the architect.

As a final caution we repeat that an inspection of the *interior* of a very cheap lock is the best, and usually the only safe way of ascertaining its true character and its fitness for the purpose in view. Cast iron keys, although largely used, should be rejected.

#### MEDIUM GRADE.

This group has been greatly improved and extended in recent years, and now includes locks excellently adapted to a large range of uses within the field of architectural practice, especially in the field of small residence work. In the latter work Rim locks of the better grade are sometimes used for attic, basement and closet doors, but otherwise Mortise locks are the rule. These should be of the *lever-tumbler* type, with at least *three* tumblers if for use on entrance doors, or other places where security is important, and with one, two or three tumblers for other locations, according to the conditions of use. Except when of heavy, and therefore somewhat expensive, construction, usually where the Bower-Barff finish, is desired, *no mortise locks*



*with cast iron fronts should be tolerated.* The fronts should be of steel, plated or capped with bronze, or else of solid bronze or brass. Cast iron bolts, bronze plated, are permissible, but those of solid bronze or brass are better and their cost not much greater. The keys should be of steel, preferably of the solid, cold-forged, type and nickel-plated. In this grade may be placed the "Vulcan" locks, (see page 128), made wholly of wrought metal, embodying many refinements and yet so moderate in price as to justify the claim that they are "the cheapest locks fit for use" within the range of architectural practice.

While the makers of the Yale Lock may fairly be said to have led the Trade in this direction, with their well-known line of "Standard locks" (introduced about 1875), all the larger manufacturers now make a variety of excellent locks of medium grade, and no difficulty exists in obtaining such goods if proper care is exercised in selection and specification. If the selection, however made, takes intelligent note of quality, and draws a fairly median line as to price, assurance may be felt that the goods will be fully up to the medium grade and that, if so, they will be suitable for all uses except those demanding the best grade of goods, but careful specification and rigid inspection will still be needed to ensure that the goods selected are actually used.

#### BEST GRADE.

Under this head come first the "Yale Locks," and others of the "cylinder" type, and these should be preferred for entrance and office doors, and all other places where high security is called for. For interior and communicating doors, locks of the "lever-tumbler" type are usually preferred, but these should be of the best and heaviest construction, with solid bronze or brass fronts and bolts, two or more tumblers, solid

steel or bronze keys, of the best workmanship and with the latest improvements. The larger locks of the "Vulcan" line fulfill these conditions. In the case of work of the importance thus implied it is always expedient, and usually feasible, to obtain expert advice from the manufacturer, or from a dealer representing him, whose intimate knowledge of the product can thus be utilized by the Architect to assist the latter in selecting the locks which will most suitably and exactly meet each of the various conditions involved. For example, the variety of Hotel locks, described elsewhere, is very large, and covers a wide range of styles and prices, but their differences involve so many technical questions as to preclude an entirely satisfactory presentation by any treatise, however full. Indeed, the higher the grade of locks the greater is the advantage to be derived from expert advice on the technical questions involved, and those best qualified by experience to give it will be found ready to respond cordially to such requests from Architects and others.

## Section 4.

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### Master-keyed Locks.

A SERIES of locks is said to be "master-keyed" when so constructed that each lock can be operated by its own key, which fits it but no other lock in the series, and also by another key which will operate every lock in the series, this latter being designated as a "master-key" or "pass-key." A series of locks, therefore, may be arranged in either of three different ways, viz:

1. All different, each key opening only one lock.
2. All alike, any key opening all of the locks.
3. Master-keyed, with locks all different (as in No. 1), but with a master-key also, which passes all of the locks (as in No. 2).

Under Plan No. 1 the tumblers or wards in each lock are so made that it can only be operated by one particular key. Under Plan No. 2 the same statement applies, the tumblers or wards being identical in every lock of the series. Under Plan No. 3 the construction is such that each lock may be passed by two different keys, one the "change key" and the other the "master-key;" one of these being variable and the other constant throughout the series. Thus each master-keyed lock has two settings or changes, one of which is different and the other of which is uniform in every lock of the series, the master-key acting on the latter. Hence arises an unavoidable diminution of security in master-keyed locks, except only in the case of the Yale Duplex system described below.

The types of locks which are available for master-keying are the following :

A. Warded Locks ; having fixed obstacles, or wards, to clear which the key must have corresponding wards or indentations.

B. Lever Tumbler Locks ; having one or more movable obstacles or tumblers, which the key must set in a certain position to permit the bolt to move.

C. Pin-Tumbler Locks (Yale system) ; having pin-tumblers which the key must set in a certain position before it can rotate to actuate the bolt.

D. Yale Duplex System ; having two separate pin-tumbler cylinders, one for the change key, the other for the master-key, either of which controls the bolt.

A series of Warded Locks is master-keyed by means of a "skeleton" key, the bit of which is cut away sufficiently to avoid all of the wards in all of the locks of the series. This affords cheapness, but offers only a low grade of security, because a piece of wire, bent into form which will clear the wards and actuate the bolt, will operate any lock of this type. Warded locks, therefore, are only suitable where cheapness is the controlling factor and security is not essential.

A series of Lever-Tumbler Locks is usually master-keyed either by providing two "gatings" on each tumbler, one of which is brought in line with the corresponding "fence" or post on the bolt by the change key and the other by the master-key, or by providing a "lifter" which, when actuated by the master-key, moves the tumblers precisely as they are moved by the change key when the latter acts directly on the tumblers. A third arrangement consists in providing a set of secondary levers which, when operated by the master-key, move the primary tumblers in the same manner as the change key which acts on them directly. Any of these constructions, well made, affords good security at reasonable cost, and therefore this type of master-keyed lock is adapted to a wide range of uses.

A series of Pin-Tumbler Locks is master-keyed by cutting each pin in two places, or by encircling the plug (which contains the key-way) with a larger annular plug, the result in either case being to provide two points at which each tumbler may be set to permit the plug to rotate, and utilizing one set of these points for the change key and the other for the master-key. This system affords excellent security and is admirably adapted for some uses, but the number of key changes it admits of is limited.

A series of Yale Duplex Locks is master-keyed by providing each lock in the series with two pin-tumbler cylinders, either of which will operate the bolt, one of them controlled by the change key and the other by the master-key. This is the *only system* in which the original security of the tumbler mechanism is retained unimpaired, and in which the number of locks which can be combined in one series is limited only by the possible number of key changes. This system therefore affords the highest security, and by far the greatest capacity for grouping into one master-key series large numbers of locks.

A series of Master-keyed Locks may also be sub-master-keyed by dividing it into subordinate groups, each of which is controlled by a sub-master-key of its own (each lock having also its own individual key), or in each of which the locks are all alike and controlled by one key, each of these keys differing from the master-key, but every lock in the entire series being also controlled by a master-key which, in this case, is usually called the "grand master-key," to distinguish it from the "sub-master-keys."

In ordering master-keyed locks it is essential to specify, in addition to the usual information as to the list number of lock, thickness and hand of door, etc., the exact number and kind of locks to be grouped under one master-key, and the floor or rooms for which each group is intended, so that they may be packed and labeled accordingly.

Before the invention of the Yale lock every different size and style of lock had a different size and style of key, so that it was only possible to group together under one master-key locks of the same kind and size. In the Yale lock, on the contrary, the size and style of key are constant throughout almost the whole range of locks, covering hundreds of sizes and kinds and available for practically every use. The Yale lock has thus made it possible to group together, under a single master-key, locks adapted to practically every purpose. The possession of a master-key which will control many, if not all, of the locks which they have occasion to use will be a new idea to most individuals. The convenience, however, of having a single key which will control all of the locks in one's house, and also if desired at one's office, store or factory, and the resulting reduction of the usual bulky bunch of keys to a few small ones, of nearly uniform size and shape, is a luxury which will appeal to every one, but which can only be fully appreciated by experience.

The number of master-keys available with any given type of lock is limited. Therefore, unless proper care is exercised, there is serious danger that the same master-key may be furnished to two customers in the same city, or even in the same street or building. The only safety against this danger lies in maintaining a careful *record* of the location of the customer using each master-keyed series of locks. To "trust to luck" in this matter is to invite almost certain trouble for all concerned.

An additional reason for maintaining such record is the fact that additions to a master-keyed series of locks are often required, sometimes at long intervals. Unless a knowledge of the key changes used in the original series is available, it is not possible for the manufacturer to furnish such additions to a series of master-keyed locks without inevitable liability to duplications and interchange of keys.

For these reasons, especially the first, The Yale & Towne Manufacturing Company has always made it a rule to decline to accept orders for master-keyed locks unless advised as to the name and location of the party by whom they are to be used. The information thus furnished exists in records which have carefully been maintained for many years, and is used solely for the purposes above explained. The maintenance of this system is essential to the protection of all customers, past and future, purchasing master-keyed locks, and the information required is treated as strictly confidential.

The manufacturers, in making this explanation, state that "it is furnished to meet the objection occasionally raised that it is 'none of our business' as to what becomes of master-keyed locks after we deliver them to a customer, but we submit that it *is* our business not to furnish a customer with a set of locks to which his neighbor already has a key, nor with a key which will operate his neighbor's locks. We appeal, therefore, to our customers to coöperate with us in maintaining the integrity of the system, and the safety which it aims to provide for all users of master-keyed locks, by furnishing us, with each order, the information needed to maintain our records."

The use of master-keyed locks is rapidly increasing, and the subject merits careful consideration in connection with the selection of locks for buildings of all kinds. Master-keys have long been a *sine qua non* in the case of locks for hotel use, and have become almost equally so in the case of locks for office buildings, but their use can be extended, with advantage and convenience, to large buildings of all kinds. Even in residences the owner will appreciate the convenience of having a *single key* which will pass at least all of the important openings, such as the entrance doors, wine closet, stable, etc., usually secured by Yale locks. A specially appropriate field for master-keyed

locks is in large industrial works and factories, where many doors require to be locked, and where the higher officials desire convenient control of *all* locks, while giving to subordinates access only to certain rooms or departments, and this subject is one which merits the careful consideration of the Works' Manager who desires to avail of modern improvements.

It must be recognized, however, that some increase of cost is inevitable if master-keyed locks are availed of, and it is of prime importance that no false economy should influence the selection of the proper kind of lock. Cheap locks afford little security, and even this is lessened where such locks are master-keyed. Moreover, master-key devices imply increased complication of mechanism, which, if not well made is liable to get out of order and to entail trouble and expense. For all these reasons master-keyed locks, wherever used, should be of good and substantial construction, in which case they will be permanently satisfactory and well worth the moderate extra expense involved. Where the best possible construction is desired the Yale Duplex System should be availed of, especially where the number of master-keyed locks is very large.

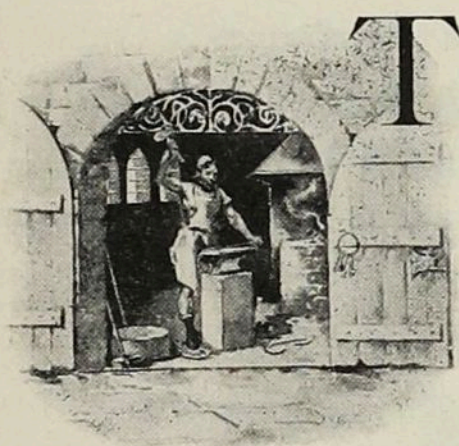
This subject is one concerning which the advice and assistance of a technical expert is exceptionally desirable, and should always be availed of if possible.

See also article on Hotel Locks, Section 11.



## Section 5.

### Wrought Metal Locks.



THE use of cast iron for locks is confined almost exclusively to America. In all European countries locks have always been made by hand and of wrought metal, their construction usually being clumsy and rough but substantial. Modern machinery, and, especially, modern steel of high quality and low cost, have combined to enable the American manufacturer to design and produce a new type of lock which combines the strength and durability of the best European locks with the mechanical excellence and moderate cost of the American cast iron lock, the new product being generally known by the name "Steel Locks."

The first practical step in this direction was taken, about 1889, by the Yale & Towne Manufacturing Company, by the introduction of a Builders' Lock (No. 1620S), with a case made of cold rolled and pressed steel, of high quality and moderate price. Several years later the "Warner" and other steel locks were brought out by other makers, but although of handsome external appearance their internal construction followed old lines and, in some cases, was distinctly inferior to that of good cast iron locks, quality being subordinated to cheapness. In this way a temporary prejudice was created against "Steel Locks" which was justified by the facts on which it rested but not by the inherent possibilities of the new material if rightly used.

Again the Yale & Towne Manufacturing Company furnished the practical solution of the question, when, in 1896, after nearly two years of preparation, it brought out its line of high grade "Vulcan" Locks, supplemented two years later by the "Vulcan, Jr." line, of cheaper construction, designed for ordinary commercial use. This new product embodies so many radical improvements, and has found such large acceptance by architects and builders, as to justify the following reproduction of the descriptive pamphlet issued by the makers when the "Vulcan" Locks were first brought out.

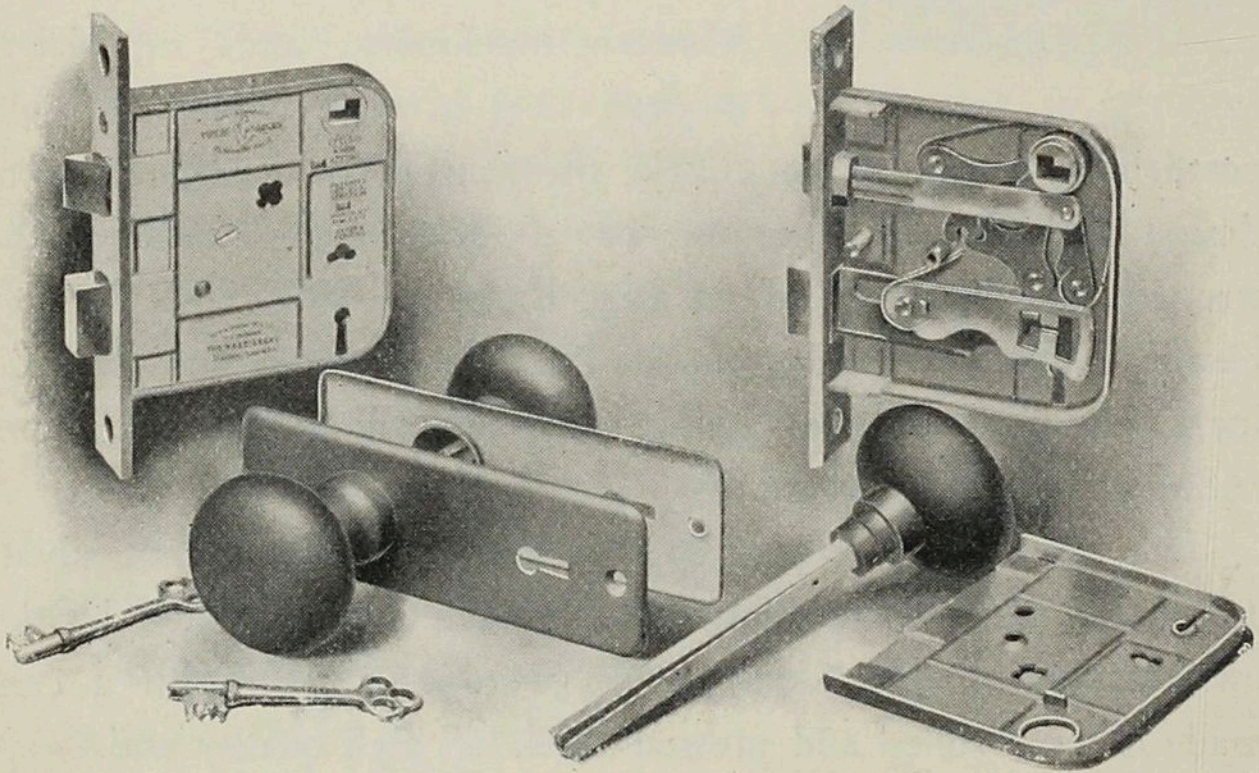


Fig. 1.

### THE VULCAN LOCKS.

The age of iron is passing and the age of steel is fully born. America has long excelled in small products of cast-iron, but it is discarding them for better ones of wrought steel. Both were formerly hand products; cast work so remains, but wrought work, in quantity, is now produced from the wrought sheet or rod by machine processes which supersede hand labor.

This new material, and these processes, have already been utilized in creating modern fire-arms, the sewing machine, the American watch and the bicycle; they are now availed of to create a new American product, namely, a door lock formed wholly from wrought materials, machine made throughout and interchangeable in all its parts.

The substitution of machine processes for hand labor, has not only produced a more perfect article, but has also effected economies which enable the Vulcan Locks to be sold at prices so low as to make them available for every purpose.

New and improved mechanisms, made possible by these new and better materials and processes, combine to make the resulting product the most important advance in the art of lock making since Linus Yale, Jr., one of the founders of The Yale & Towne Manufacturing Company, a few years before his death, in 1868, invented the Lock which will forever be associated with his name and which has completely revolutionized American practice in lock making.

#### CONSTRUCTIVE FEATURES.

**THE CASE AND CAP.** (Fig. 1.)—These are of cold-rolled steel, each flanged on the outer edge and ribbed in transverse lines, thus obtaining greater rigidity and far greater strength than that of a cast lock of twice the weight.

The dimensions and weights of all the parts are those suitable to give proper strength. All the parts being of wrought metal, the total weight is somewhat less, and the strength of each part much greater, than if cast metal were used.

**THE FRONT.**—As shown by Fig. 2, this consists of a wrought steel base, attached to the case by two cheeks, over which is drawn a skelp or cover of wrought bronze, clinched over the tapered edges of the base, thus firmly uniting the two and pro-

ducing a front of great stiffness, having true edges, beveled to fit snugly into the wood, and a surface admitting of the highest polish. This construction is further illustrated by the enlarged detail in Fig. 3, showing a cross-section of the completed front.

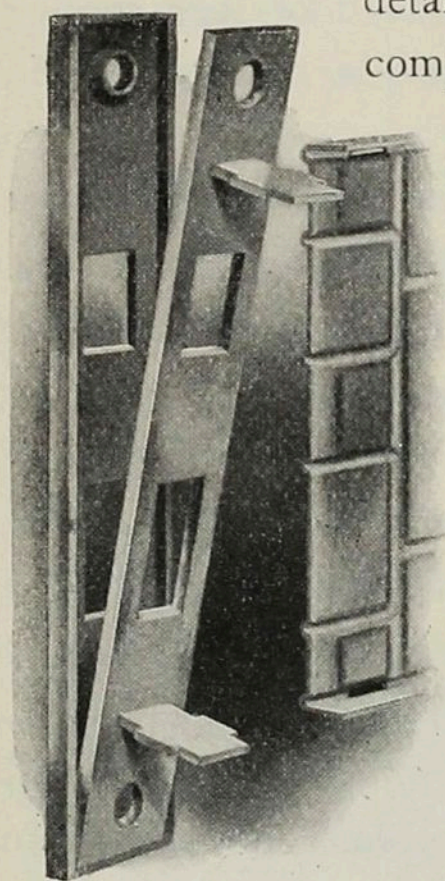


Fig. 2.

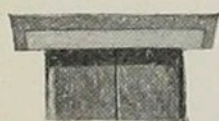


Fig. 3.

**THE BOLTS.**—The Latch-bolt and the Dead-bolt each consists of a solid head of wrought bronze or steel, and a wrought steel tail-piece, forced into the head and secured thereto by riveting and by setting down the metal of the head over interlocking projections on the tail-piece, as shown by the illustration of latch-bolt in Fig. 4. The tail-pieces are ribbed or corrugated to give added stiffness.

**THE KEY.**—The key of the Vulcan Lock, shown by Fig. 5, is of solid steel and is cold-forged from open-hearth metal. It is machine finished, nickel-plated and finely polished. Its bow is of the well-known Trefoil design, so long identified with the Yale Lock, and bears on one side the Trefoil trade mark of the makers. The form of the key is peculiarly graceful, and its oval cross-section gives great strength.

The bit is tapered, being thickest at the outer edge, thus giving a better wearing surface, and a smoother action on the tumblers and bolt, than keys having thin bits.

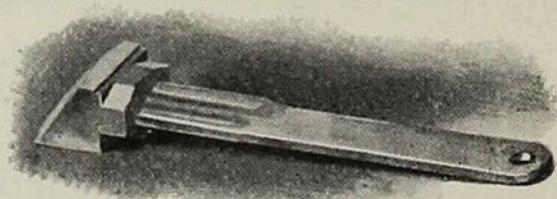


Fig. 4.

THE COMPLETED LOCK.—The external and internal appearance of the several parts when completed and assembled is shown by Fig. 1.

THE CYCLOID KNOB ACTION.—In this is embodied a new principle and a great advance in lock mechanism. It discards the sliding action used heretofore and substitutes pivotal motions and inter-gearred levers, every piece being machine made from wrought metal. Fig. 6 shows the mechanism in its normal position. The hub, by which the rotary action of the knob is transmitted, has a single arm or cam projecting diagonally downward. Bearing against each side of this cam are two pivoted levers, geared together at their other ends, so that motion of the cam in either

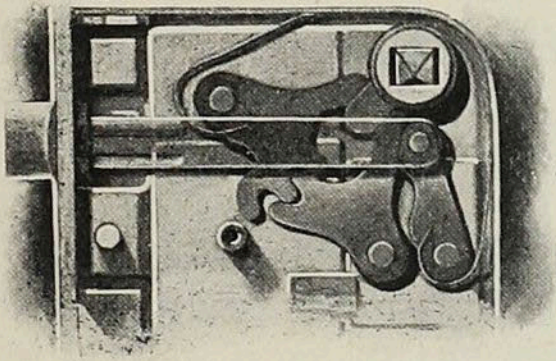


Fig. 6.

direction produces the same effect upon the levers, causing the lower one to move backward, carrying with it the third lever, to which is pivoted the end of the latch-bolt. This spring alone opposes

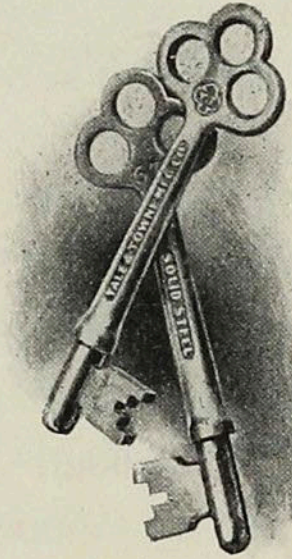


Fig. 5.

direction produces the same effect upon the levers, causing the lower one to move backward, carrying with it the third lever, to which is pivoted the end of the latch-bolt.

Fig. 7 shows the parts in the position they occupy when the latch-bolt is forced back, as in closing the door. One of the

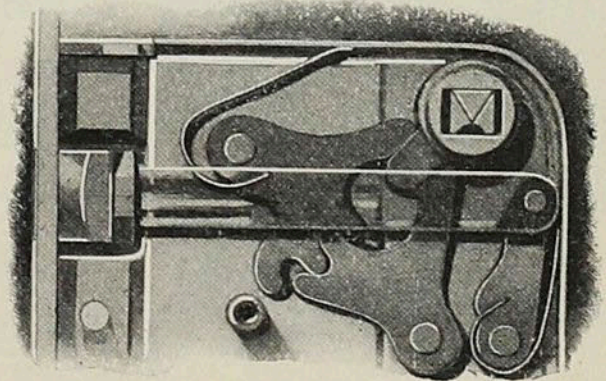


Fig. 7.

resistance to the retraction of the latch-bolt, while both springs oppose rotation of the knobs. The most perfect "easy-spring" action is thus obtained. The latch-bolt is reversed by removing cap of lock. Fig. 8 shows the latch-bolt retracted by rotation of the knob in either direction, and shows also the construction of the hub or cam from two pieces of wrought metal, machine made throughout. As seen in Fig. 1, the holes or trunnions in the lock case are flanged inward to provide a broad bearing for the ends of the hub, these bearings being accurately fitted by machine processes. The bearings for the key are formed in like manner.

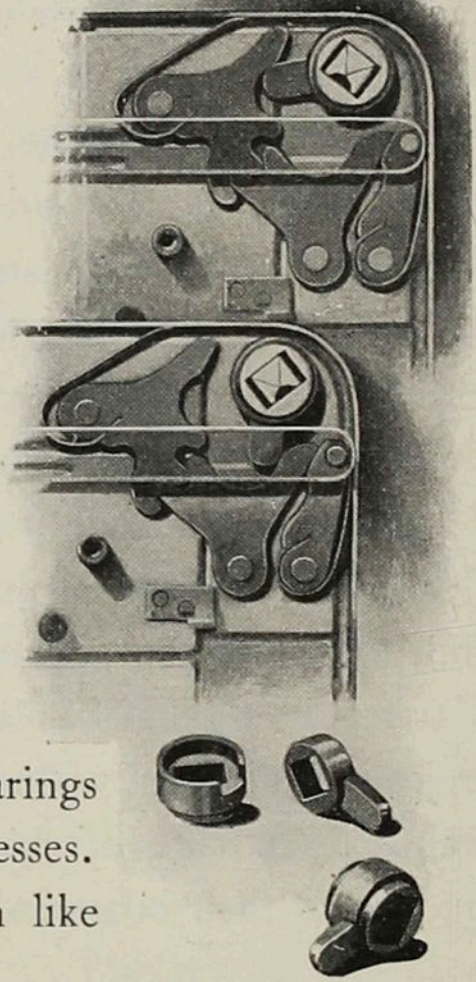


Fig. 8.

In other wrought metal locks these bearings are merely holes punched in the metal, and their thin edges tend to cut into the metal of the hub or key, the result being rapid wear, which, in the case of the hub, produces looseness and rattle, and, in the case of the key, disturbs its relations with the tumblers so that it soon works badly and ultimately may fail to operate the lock. The broad bearings in the Vulcan Lock obviate all of these difficulties.

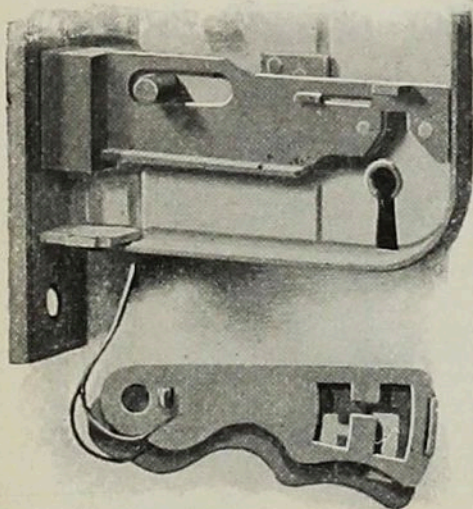


Fig. 9.

**THE DEAD-BOLT ACTION.**—The method of constructing and guiding the Dead-bolt is shown by Fig. 9. Its bottom edge is flanged to give stiffness, its rear end is thickened by a reinforce

to give a broad bearing for the key in the "talon," and its motion is guided and checked by a stud attached to the case and fitting within a guide-slot in the bolt-tail.

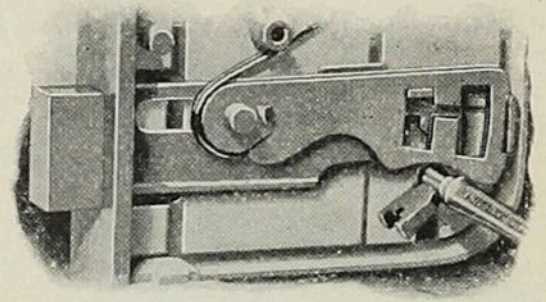


Fig. 10.

The Tumblers, of which in some locks there are two and in others three, are of the double-acting lever type, as also shown in Fig. 9. The "fence" or post on tail of bolt fits within the segmental openings of the tumblers and must pass the narrow gating between them to permit the bolt to move. To accomplish this the key must accurately raise each tumbler to the exact position, neither too high nor too low, to permit the fence to enter and pass through the gating, thus securing ample protection against picking and against the unintentional interchange of keys. Fig. 10 shows the key in place ready to operate the tumblers and retract the bolt.

**THE TRIPLEX SPINDLE.**—This Spindle, already in use with the Yale Locks, is used also with the Vulcan Locks. (See Section 15).

**THE COMPENSATING HUB.**—Heretofore lock makers have ignored the fact that all wood shrinks and swells with changes in the humidity of the atmosphere. Hence has arisen the dilemma that knobs must be loosely fitted or else will bind. This is due to the conditions illustrated by Fig. 11. As there shown the lock is attached by its front to the edge of the door, while the escutcheon plate (which carries the knobs) is attached by its screws to the surface of the door at the distance "X" from its edge. Any shrinkage or swelling of the wood causes this distance "X" to vary and thus tends to cause the knobs if well fitted, to bind. The Compensating Hub, as shown by Fig. 11, has a rectangular opening which fits the spindle vertically, but which is considerably elongated horizontally. Changes in the

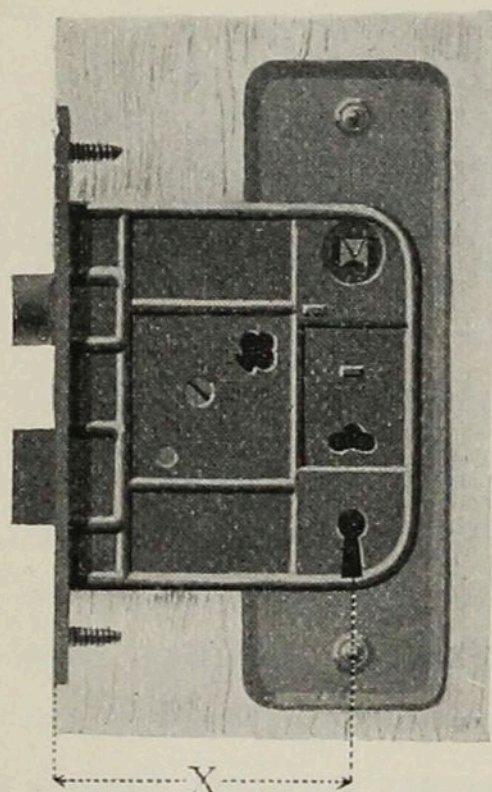


Fig. 11.

dimension "X" may thus occur without causing the knobs to bind, and yet rotation of the knobs will cause the spindle to actuate the hub, by contact of the upper and lower sides of the spindle with the opposing faces of the opening in hub, as perfectly as if all four faces of the spindle and hub-opening were in contact, as heretofore. This simple device makes possible the use of perfectly fitted knobs by eliminating the disturbance arising from shrinkage, which heretofore has been so common a cause of trouble.

**THE BRACKET BEARING.**—A lock spindle is practically a short piece of shafting, with a wheel or pulley (the knob) on each end. Obviously the bearings of such a shaft should be as far apart and as near to its ends as possible. In common locks, on the contrary, they are at the surface of the door and therefore near together. This has long been remedied in the case of the Yale Lock by the use of the "Bracket Bearing," which will also be used with the Vulcan Locks. It consists of a construction of the knob shank, and its supporting thimble, such as to bring the bearings or points of support as close to the knobs, and therefore as far apart as possible. The mechanical difference between these methods will be apparent from Fig. 12, which shows the old and the new constructions. The dotted lines show the play or "wobble" of the common knob, with its clumsy adjustment by means of a row of screw holes in the spindle, supplemented by tin washers in the loosely fitting thimble or bearing close to the surface of the door.

In marked contrast to this is the easy and perfect adjustment



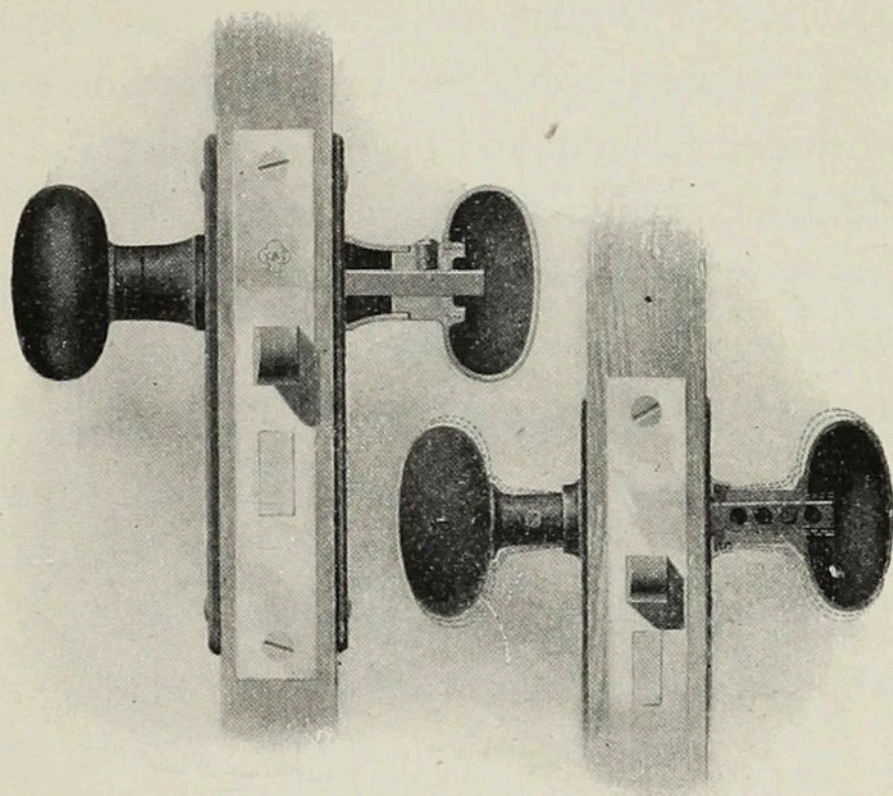


Fig. 12.

o. the knob by means of the Triplex Spindle; the supporting of the thimble close to each knob; the well-fitted Bracket Bearings in which the knob rotates, as shown in the left-hand picture.

**THE MECHANICAL COMBINATION.**—The Triplex Spindle, admitting of perfect longitudinal adjustment of the knobs, the Compensating Hub, which eliminates disturbance from shrinkage and swelling of the wood, and the Bracket Bearing, which supports and guides the two ends of the spindle close to the knobs, combine to produce a perfect mechanical assemblage, easy to apply, eliminating all causes of future disturbance, pleasing, because inherently right in appearance, and, as already proved, certain to give permanent satisfaction.

**THE TRIM.**—Fig. 1 shows one of the plain, wrought metal trims used with the Vulcan Locks, but, in addition to plain trim, in bronze, brass or Bower-Barffed steel, they are furnished with ornamental trim in great variety. These ornamentations, and also the extensive line of Vulcan Locks, are described and illustrated in a separate catalogue.

THE RESULT.—The many and important improvements herein briefly referred to are the outcome of the work of several years, aided by unrivaled facilities and by the experience of the makers of the Yale Lock, acquired during the past twenty-five years. The final result is the creation of a new mechanical product, as far in advance of all predecessors as is the Yale Lock in the field where it has so long held a position of undisputed leadership.

## Section 6.

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### “Cylinder” and “Pin-tumbler” Locks.

**T**HESE terms have come into general use to designate locks of the “Yale” type ; the name “cylinder lock” applying to Builders’ and other locks in which the pin-tumbler mechanism is contained in a “cylinder” separate from the lock case, and the name “pin-tumbler lock” being usually employed to designate Cabinet and other small locks in which the pin-tumblers are contained in the lock itself, although the latter term applies broadly to both groups.

As all other makers of these locks have copied the Yale Lock, more or less closely, it is unnecessary to repeat here the very full description of this type of lock given on page 71. It is proper to point out, however, that in cylinder as in other kinds of locks, there is room for a wide range in quality, and a corresponding need of careful selection. Copies are rarely as good as originals, because not based on the same long experience and complete knowledge, added to which, in some cases, are lower standards of workmanship and an effort after cheapness. But most locks of this type aim to be of better quality than common locks, and many are thoroughly good, although, of course, none but the genuine Yale Lock have the Paracentric Key and Key-way (see page 77) and other latest improvements.

All cylinder locks are not necessarily of the pin-tumbler type. Other kinds of tumbler mechanism have been adopted in connection with lock “cylinders,” some of which are fairly good, but others distinctly bad. Those who like to experiment can select the better of these modifications, but those who prefer otherwise are advised to avail of articles of established reliability, especially at the small difference in cost which usually exists.

Cylinder locks should be given preference for all important uses, especially for the entrance doors of residences, stores and offices, not only because of their high security but also because the keys of such locks are, as a rule, carried in the pocket, and no other keys are so convenient as those of the Yale type. Cylinder locks, on the contrary, are not expedient for hotel use, because the small key is liable to be lost or accidentally carried away, nor for interior doors of communication the keys to which are commonly kept in their locks. A good general rule is to adopt cylinder locks *wherever the key is to be carried habitually in the pocket*, and elsewhere to use lever-tumbler locks of good quality.

## Section 7.

### Keys.

**K**EYS are made in endless diversity of size and form, but can all be classified into a few types.

**THE ROUND CAST KEY (Fig. 1).**—This is the commonest type and is used with a great variety of Builders' Locks.

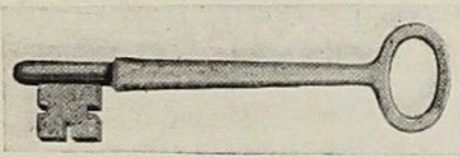


Fig. 1.

Made of cast iron it is easily broken, and is only used with the cheapest locks. Made of malleable iron, and tinned or coppered, it is serviceable,

although not handsome. Made of bronze or brass it is excellent, and if then well finished, is suitable for any appropriate use.

**THE ROUND STEEL KEY (Built up.) (Fig. 2).**—This key, built up of several pieces well united, was formerly very popular and is still much used, although now being displaced by the solid steel key. It is smaller and neater than the cast key, and usually better.

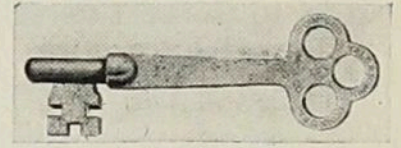


Fig. 2.



Fig. 3.

**THE SOLID STEEL KEY (Fig. 3).**—This is a single piece of wrought steel, usually cold-forged, and, being in all respects the best key of this type, should always be

given the preference.

**THE BARREL KEY (Fig. 4).**—This is a round key with a hole in its end to fit over a pin in the lock, and obviously can be made in the same manner as any of the foregoing. It can only be employed where the lock

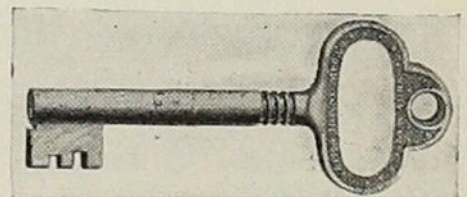


Fig. 4.

has a key-hole on but one side, or if on both sides not opposite,

and hence is little used, except with cabinet locks, and with certain hotel locks, for which latter it is to be recommended.

THE CYLINDER LOCK KEY.—This is always of the Yale type, and nearly always has the trefoil bow, (as shown by Fig. 5) which was used originally with the Yale

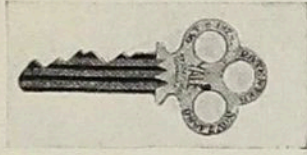


Fig. 5.

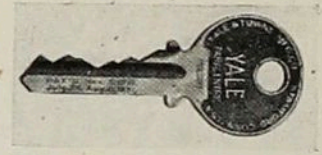


Fig. 6.

Lock and has been copied by almost every lock-maker. The *genuine* Yale Locks *now* all have Paracentric Keys, with the new design of bow shown by Fig. 6, the key being made of nickel bronze, and its bow gold plated.

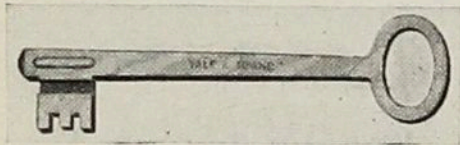


Fig. 7.

THE FLAT STEEL KEY.—This requires a revolving “center,” or hub, in the lock to

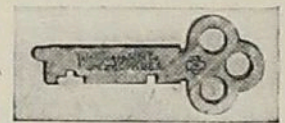


Fig. 8.

guide and support the key, and is not much used with Builders' Locks. When so used its form is usually as shown by Fig. 7. It is extensively used with cabinet locks, however, and in two forms, viz: Single-bitted as shown by Fig. 8, and double-bitted as shown by Fig. 9. It is also extensively used with padlocks and trunk locks. A key with flat bow and bits and a round stem is shown by Fig. 10.

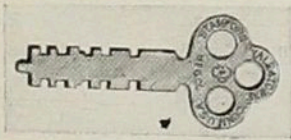


Fig. 9.

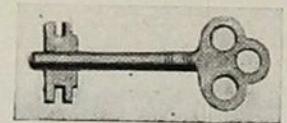


Fig. 10.

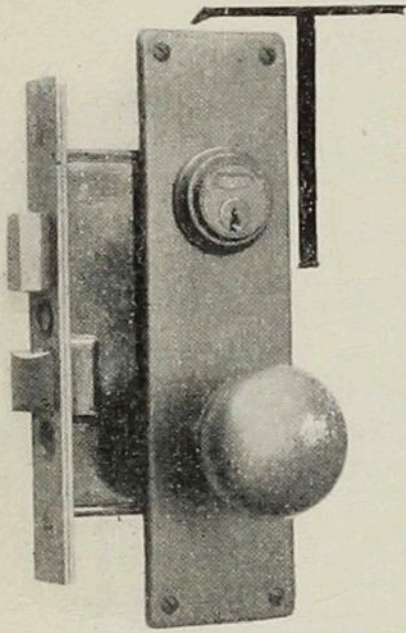
In selecting locks the style, size, material and finish of the keys should all have due consideration.

The *number of keys* per lock varies. Cylinder locks are always furnished regularly with three keys each, while other Builders' locks usually have only one key each. If more are required they should be called for in specifications. For interior doors one key per lock is usually enough, as if two are supplied the extra one can seldom be found should it be needed.

Duplicate and extra keys can usually be obtained from dealers and locksmiths, or, if not, by application to the maker, whose name and address can usually be found on the key or its lock. On this point, however, note the further information given on pages 77 and 124.

## Section 8.

### The Front Door Lock.



TECHNICALLY a front door lock is one having two bolts, a dead bolt and a spring bolt (or night latch), and equipped with a pair of knobs, to operate the latch bolt, so arranged that the *outer knob*, by means of a “stop,” may at will either be set to operate the latch bolt or be cut off or stopped so that it cannot operate it, in which latter case a key is required to operate the latch bolt from the outside.

Formerly each of the two bolts was operated by a separate key, but in 1869 the fact was perceived (by the author) that the Yale system admitted of an arrangement whereby one key would suffice to operate *both bolts*, and the original Yale front door lock was designed accordingly. This arrangement was never patented and is now in common use, having been applied both to cylinder and lever-tumbler locks.

The “cylinder” type of lock is the best, in every respect, for front door use. The sole merit of other types is slightly lower cost, and their use is now generally limited to dwellings of the cheapest class. A front door lock of the Yale (or “cylinder”) type affords its owner the highest security, the most convenient key, the control of his entrance door at all times, and the opportunity to enjoy the luxury of having a single “master-key” which will operate this and all other



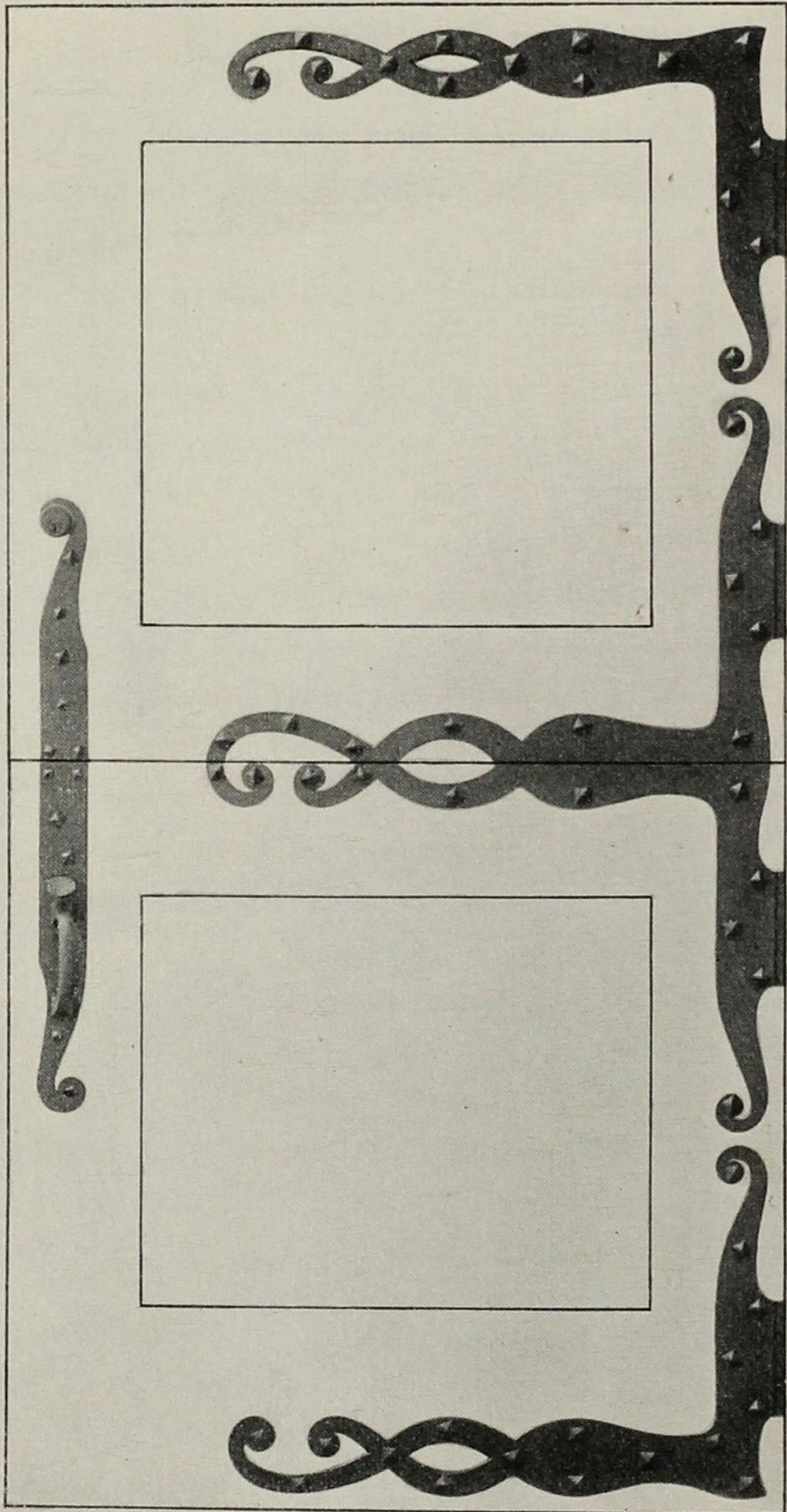
important locks he uses. Information as to the sizes, styles and prices of front door locks is given in Part IV.

Where a residence has an inner, or vestibule, entrance door, a front door lock can be used on it also, but it is more customary to use a "vestibule latch," which is a front door lock complete in all respects except that the dead bolt is omitted. In either case the two locks should be "alike," that is, so that the same key controls both.

Where a front door already has a lock of the old type, and the owner desires the safety and convenience of a Yale lock, it is customary to apply a separate "cylinder" Night Latch, above the front door lock, setting the "stop" of the latter so that its night latch mechanism will be inoperative, but the better plan, where the moderate difference in cost is not objectionable, is to replace the old front door lock with a modern one of the "cylinder" type.

A special form of front door lock is made which is so arranged as to permit the use of handles and thumb-pieces, in place of knobs, for operating the latch bolt, as explained in the article on store door trim, page 159.

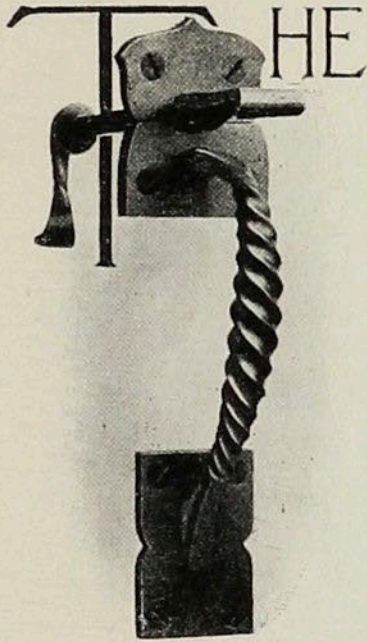
For iron and bronze doors and grilles a front door lock is made with one-inch backset, thus greatly reducing the width of the lock and adapting it to the narrow stiles common to such doors. This lock necessitates the use of lever handles in the place of knobs, and where they are used it is better to omit the "stop-work," as the unbalanced weight of such handles is liable in time to derange the stop mechanism.



Trim for Dutch Door.

## Section 9.

### Dutch Door Trim.



THE use of the so-called "Dutch" door for entrances, that is one divided horizontally into an upper and lower leaf, is quite common, especially in country houses, and such doors require some special fastenings.

For the lower leaf the best fastening is a vestibule latch, that is a lock having a spring bolt operated from either side by the knobs, and from the outside by the latch key. Frequently a store door handle with thumb-latch is substituted for the outer knob, in which case a special lock is needed (such as No. 732). A handle of this kind is more in character with the style of such a door than a knob, although the knob is usually preferred on the inside. The stop-work of this lock enables it to be set so that it may be opened from the outside either by the knob (or handle), or only by the key, as preferred.

For the upper leaf a mortise dead lock (such as No. 348) is best, the bolt of which is operated from the outside by key and from the inside by thumb-knob or key, as preferred. The joint between the two leaves being rabbeted, the dead lock on the upper leaf serves to secure both.

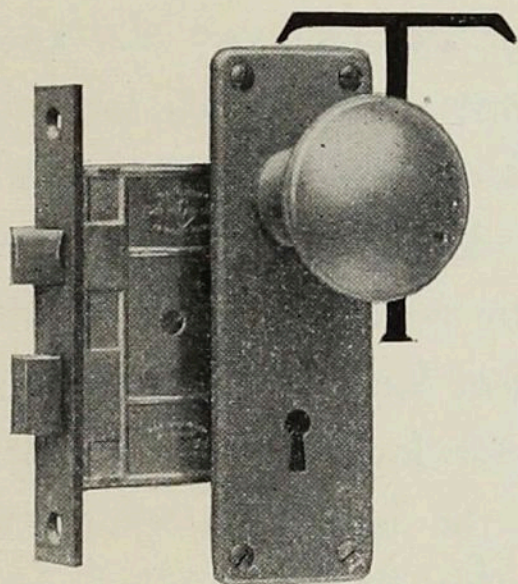
To secure the two leaves together the best fastening is a mortise knob latch, rabbeted to correspond with the edges of the doors, (such as No. 1000R). This should have a knob on the inside only, whereby the latch can conveniently be withdrawn when it is desired to move the upper leaf separately from

the lower leaf. Occasionally a quadrant, or other clamping device, is added to draw the two leaves tightly together.

The accompanying illustration (page 144) shows a well designed ornamental *trim* for a Dutch door, so arranged as to preserve its effect whether the two leaves are united or separated; the *fastenings* consist of a simple latch on the lower leaf, operated by a thumb handle, and a cylinder dead lock on the upper leaf, the two leaves being fastened together by a knob latch operated by knob on the inside of door.

## Section 10.

### Locks for Residence Use.



THE subject of Locks for Entrance Doors has been discussed in the article on Front Door Locks, page 142, supplementing which the following suggestions are offered as to the selection of locks for the inside doors of private residences.

Yale locks, of the cylinder type, are only advisable for rooms and closets usually kept locked, the keys to which are habitually carried, and where privacy and safety are desired; elsewhere locks of the lever tumbler (bit-key) type, with solid steel keys, are preferable, especially if the keys are to be retained in the locks. Great convenience will result from having all the Yale locks in a residence, including those on entrance doors, set to a master-key, the possession of which will give the owner control of all such locks, although each of them may also have its own individual or "change" key, differing from all others in the series. When locks are so wanted, the original order should specify that they are to be master-keyed. Further convenience will result in most cases from having the keys for room and closet doors alike throughout the house, or alike by floors, instead of all different, as is the common practice. In this way, the loss of a key will cause little or no inconven-

ience, as any key will open any lock in the series, while privacy and security to the occupant of a room will remain unimpaired because the presence of a key in its lock will prevent the insertion of another key from the other side of the door. The adoption of this reform is recommended to architects, and will be appreciated by their clients.

For the main, or parlor floor, 4 or 4½ inch two-bolt knob locks should be used for swinging doors, and 5½ inch locks for sliding doors; the latter containing a dead bolt only (so constructed that unequal settling of the doors will not prevent its free action), and a pull or handle by which to withdraw the door from its recess. Other forms of locks for sliding doors are made to meet special cases. Knob locks may be trimmed either with knobs or lever handles, the latter conforming to French and German practice and being especially suitable on French windows and on doors with narrow stiles. Locks for sliding doors were formerly trimmed with knobs, but present practice favors the use of cup escutcheons, which permit the door when open to slide entirely into its recess, so that only its edge is visible, the lock used in such cases having a pull or hook in its front whereby the door may be pulled out of its recess.

For closet doors, on all floors, it is best to use a two-bolt knob lock, of 4 inch size, with trim on both sides, so that the door may be opened from the inside in case it is accidentally closed while a person is in the closet, and so that it presents a good appearance if standing open; but a slight saving may be effected on doors for shallow closets by omitting the inside trim and using only a half-pair of knobs. In many cases a knob latch, without dead bolt, is sufficient. For wine, silver and linen closets, etc., a Yale lock should be used. This is usually

a mortise or rim night latch, although a dead lock is sometimes preferred. A knob latch may be added below, and is sometimes convenient.

For bedroom doors a 5 inch three-bolt knob lock is best, because providing a thumb-bolt on the inside in addition to the dead bolt operated by the key. While it is customary to use the full trim on both sides of such locks, that is, an escutcheon plate having on the outside a knob and key-hole, and on the inside a knob, key-hole and thumb-piece, a more pleasing effect may be obtained by using a separate knob rose and key-plate on the outside, and on the inside a knob rose and thumb-piece. Where a smaller and cheaper lock is wanted a 4 inch two-bolt knob lock is suitable, and this may be supplemented by a separate thumb-bolt.

For basement and attic floors  $3\frac{1}{2}$  or 4 inch mortise locks are appropriate, and where economy is sought may have steel fronts, bolts and trim, bronze or brass plated. Rim locks are still cheaper, but are rarely used except in buildings of the cheaper grade.

Bathroom doors should always be provided with a thumb-bolt, either separate or combined with the main lock.

Communicating doors between rooms should have a three-bolt knob lock, the latch bolt operated by the knob from either side, and below this two dead bolts, operated by thumb-pieces on opposite sides of the door. Locks of this character are made both for swinging and for sliding doors.

Twin doors (see page 151) are sometimes used in residences, to deaden sound and to increase privacy, and should have the same locks and trim as other communicating doors, except that, because of the limited space between them, the trim on the

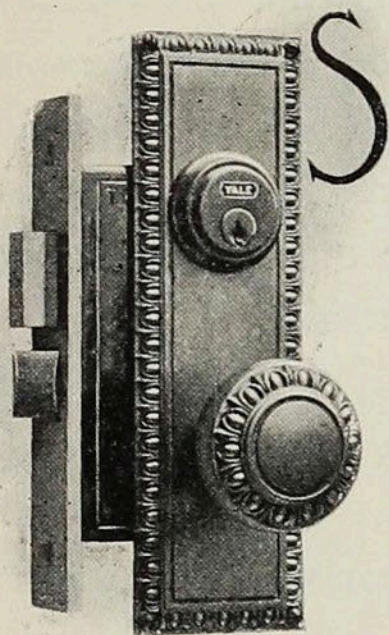
abutting faces of such doors must usually be special, to prevent interference. For this purpose both knobs and lever handles are made which project very slightly from the door.

Where double swinging doors are used, their abutting edges may be either rabbeted or covered by astragals; if rabbeted, the locks should be ordered accordingly, and the step of the rabbet should be one-half inch, to conform to the locks.



## Section 11.

### Hotel and Office Locks.



SECTION 4 of this Part (page 121) explains the construction and uses of master-keyed locks, but the employment of such locks in large groups, as in the case of large Hotels and Office Buildings, calls for further discussion.

The term Corridor Door designates the entrance from a corridor or hallway to a bedroom or office; Communicating Doors are those between adjacent rooms; Closet Doors are those to closets within a room. Any of these may be double or single, hinged, or sliding. A Twin-Door is one of a pair of communicating doors, *each* fully closing the *same* door-way between adjacent rooms, one opening into each room, the purpose being to increase privacy by deadening the transmission of sound, a practice common in Europe and worthy of all encouragement here, especially in view of the American tendency to needlessly provide communicating doors between bedrooms in hotels.

Each of these doors require a knob lock, that is one having a *latch* bolt operated by knobs and a *dead* bolt operated by a key, except that the dead bolt is sometimes omitted in the case of locks for closet doors, and that a thumb-bolt is sometimes substituted for the dead bolt in the case of locks for communicating doors. While all of the locks thus enumerated are used in Hotels, and most of them in Office Buildings, technically a "Hotel

lock" is a master-keyed knob lock for doors from corridors to bedrooms, and an Office lock is an inverted knob lock, (*i. e.* with keyhole above the knob), usually master-keyed, for doors from corridors to offices.

Such locks may be master-keyed on any of the systems explained in Section 4 (page 121), but while for offices the cylinder lock, with small key, is distinctly the best, because its key is permanently carried, a high grade lever-tumbler lock, with round key of substantial size, has heretofore been preferred for hotel use, because the keys are liable to hard usage, and it is not desirable that they should be too portable.

Hotel locks vary widely in *arrangement*, as well as in size, quality and price. As the simplest way of explaining these variations the following tables are given of typical Corridor Door locks with various key and bolting mechanisms, made by the Yale & Towne Manufacturing Company. Those for Hotels are shown on opposite page and those for Office Buildings on page 157.

#### HOTEL LOCKS.

The *latch bolt* is generally operated by the knobs, from both sides of the door; the *dead bolt* action varies as stated in table on opposite page.

As used in table, "C" designates the change or guest's key and "M" the master-key. Either of these may be of the solid or barrel type. The key-holes may be opposite or not, that is, in line or out of line with each other.

In some locks there is only *one* dead bolt: in others *two*, each

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#### FOOT NOTES TO TABLE ON OPPOSITE PAGE.

\*"C" designates the Change or Guest's key. "M" designates the Master-key. Either of these may be of the Solid or Barrel type. "T-P" designates Thumb-piece. "Dbl." designates Double. "Inverted" designates that the keyhole is above the knob. Keyholes may be opposite or not opposite, that is *in* or *out* of line with each other. In Y. & T. locks this difference in position is always vertical.

†Prices are for the lock only *without* Trim, but *with* Bronze or Brass Front and Bolts.

| Catalogue No.                    | Size Inches                   | Key Changes. | Price Each.† | DEAD BOLT OPERATED FROM  |   |
|----------------------------------|-------------------------------|--------------|--------------|--|---|
|                                  |                               |              |              | Outside*   | Inside*   |
| 1685                             | 6 <sup>3</sup> / <sub>8</sub> | 43,680       | \$11.00      | By C at all times, and by M when locked from outside, but not when locked from inside. | By C only. Keyholes not opposite.                           |
| 1695                             | 6                             | 3,600        | 10.50        | By C and M at all times.   | By T-P only. Keyholes opposite.                             |
| 1696                             | 6                             | 3,600        | 9.00         | By C and M, except when locked from inside.  | By T-P only. Keyholes opposite.                             |
| 1697                             | 6                             | 3,600        | 10.50        | By C at all times, and by M except when locked from inside.                            | By T-P only. Keyholes opposite.                             |
| 1698                             | 6                             | 3,600        | 10.50        | By M at all times, and by C except when locked from inside.                            | By T-P only. Keyholes opposite.                             |
| 1699                             | 6                             | 3,600        | 10.50        | By C and M at all times.   | By C and M. Keyholes opposite.                              |
| 1690                             | 6                             | 4,800        | 8.50         | Dbl. Bolt. by C and M, except when locked from inside.                                 | By C only. Keyholes not opposite.                           |
| 1680                             | 5 <sup>1</sup> / <sub>2</sub> | 2,400        | 8.25         | Dbl. Bolt. by C and M, except when locked from inside.                                 | By T-P only. Keyholes not opposite.                         |
| 1680 <sup>1</sup> / <sub>2</sub> | 6                             | 2,400        | 8.25         | Same as 1680 but "inverted."   | By T-P only. Keyholes not opposite.                         |
| 1670 <sup>1</sup> / <sub>2</sub> | 6                             | 1,920        | 7.50         | Dbl. Bolt. "Inverted." By C and M, except when locked from inside.                     | By C only. Keyholes not opposite.                           |
| 1671 <sup>1</sup> / <sub>2</sub> | 6                             | 1,920        | 8.00         | (For communicating doors) by C and M at all times.                                     | By same or different C key and by M. Keyholes not opposite. |
| 1402                             | 5                             | 1,920        | 5.00         | By C and M at all times.   | By C and M: also T-P. Keyholes opposite.                    |
| P2535                            | 5                             | 1,920        | 5.10         | By C and M at all times.   | By C and M: also T-P. Keyholes opposite.                    |
| 1445                             | 4 <sup>3</sup> / <sub>4</sub> | 1,920        | 6.50         | By C and M at all times.   | By T-P only. Keyholes opposite.                             |
| 1500                             | 4 <sup>1</sup> / <sub>4</sub> | 1,920        | 2.85         | By C and M at all times.   | By C and M at all times. Keyholes opposite.                 |
| 1620                             | 3 <sup>1</sup> / <sub>2</sub> | 1,920        | 2.30         | By C and M at all times.   | By C and M at all times. Keyholes opposite.                 |
| P1793                            | 5                             | 300          | 3.80         | By C and M, except when locked from inside.  | By C and M. Keyholes not opposite.                          |

\* † For foot notes see opposite page.

operated from one side only, and in still others a *thumb-bolt* operated from the inside only.

An "inverted" lock is one with key-hole above knob.

Lock No. 1685, in table, (page 153) was designed and made expressly for the Waldorf-Astoria Hotel, New York, and is unquestionably the best of its kind, its key-action giving exactly the protection and facilities which are most desirable. It does not embody an inside thumb-bolt because the laws of New York require an inside bolt, *separate from the lock*, on the door of every hotel bed-room. The one used in the Waldorf-Astoria is No. 1050. In some locks, Nos. 1402 and P2535 for example, a thumb-bolt is incorporated with the lock, while in still others, Nos. 1695, 1696, 1697 and 1698, and No. 1680 for example, there are *two* dead bolts, one operated by the keys from the outside, and the other by keys or by a thumb-piece or knob from the inside.

The kind of "action" to be adopted in a hotel lock is usually determined by the preference and experience of the hotel manager, and it is desirable that he should be consulted in advance, but it varies also according to the location and uses of each door, and the whole subject is one requiring most careful consideration. (See specifications for Hotel locks in Part IX.)

A new departure has been made in some of the finest hotel buildings recently erected in New York by using the Yale lock ("cylinder type") on all corridor doors. In some cases a regular front door lock (No. 726,) has been used, the "action" being as explained on page 142. By far the best practice, however, consists in using the Yale Duplex latch No. 6274, (see table page 157,) which combines with the results obtained by Hotel lock No. 1685, the great advantages of the "Duplex" master-key system, and all the good qualities of the Yale lock. The No. 6274 lock has a latch bolt, operated by

knobs from both sides and by key from the outside only. A thumb-knob on the inside locks the door against the master-key but *not* against the change-key, while the latter will always open the door from the outside. The main knobs are on a swivel spindle, with stop-work whereby the outside knob may be stopped or not, as preferred. In one large hotel these locks are arranged as follows: the regular "armor-plate" (or false front) of the lock is not pierced for the stops, thus keeping the outside knob permanently stopped, so that the door can only be opened from the outside *by the key*, but a supply of special "armor-plates" is provided, which are pierced for the stops, thus enabling the outside knob to be stopped or unstopped at will, and where a permanent guest prefers the latter "action" the lock is so altered by simply changing its armor-plate.

The grouping of locks in a hotel under various master-keys is another phase of the subject, also requiring careful consideration *in advance*. The usual, and best, plan in large hotels is to group all locks on each floor under one master-key, and to provide a different master-key for each floor. In some cases a "grand master-key" is also provided which will pass all of the locks on every floor, this entailing some extra expense, but this plan is open to the objection that in case one such key is lost entire safety can only be re-established by resetting the *entire series* of locks to a new grand master-key. In like manner safety demands that in case of the loss of *any* master-key all of the locks controlled by it should at once be reset to a new "change" or combination. This is a troublesome and expensive matter, involving the removal of every lock from its door, and, therefore, the custody of all master-keys should be limited to the smallest possible number of responsible persons.

In arranging the grouping of locks under a master-key system it is often expedient to have some, or even many, of them set

to the same change-key, rather than to different keys, and so doing tends to simplify the system ; whereas, in other cases, it may be desirable to have every change key different, and every lock controlled by the master-key, but a certain group of the locks controlled also by a sub-master-key, although so doing further complicates the system. In the case of buildings requiring large numbers of master-keyed locks, especially if the grouping is complicated, consultation *in advance* with the lock-maker, or other qualified expert, is always to be advised.

#### OFFICE LOCKS.

Most of the remarks above, relating to Hotel locks, apply equally to Office locks, especially as to master-key arrangement, but the two types of locks differ considerably, both in use and in "action."

In response to an early demand for a lock adapted to the requirements of the modern office building, the author (about 1883) designed a "cylinder" (Yale) knob-lock, in which the knobs were placed *below* the key-holes instead of *above* them as is customary. Experience quickly showed that the "inverted" lock is the best form for office doors, and nearly all office locks are now so made. It is also occasionally preferred for front door and other use. A Hotel lock must secure the door both when the room is occupied and when it is not, whereas an Office lock is chiefly to secure it when *not* occupied : hence certain differences in "action" arise.

As the simplest way of explaining these variations we give on opposite page a table of typical Office locks made by the Yale & Towne Manufacturing Company. The reference letters in table have the same significance as in the preceding table of Hotel locks, most of the locks, however, being of the Yale type, with Paracentric keys. The prices are for the locks only, without trim, but with bronze or brass front and bolts.

| Catalogue No. | Size Inches | Key Changes. | Price Each † | LOCKING ACTION EFFECTED FROM                   |  |
|---------------|-------------|--------------|--------------|--|--|
|               |             |              |              | Outside*                                       | Inside*  |
| 654           | 5 1/2       | 50,000       | \$13.20      | By C and M.                                    | By C and M.                                    |
| 614           | 5 1/2       | 50,000       | 13.20        | " " " "  | " " " "  |
| 660           | 4 1/2       | 50,000       | 11.60        | " " " "  | " " " "  |
| 750           | 6           | 50,000       | 15.20        | " " " "<br>when Knob is set by Stop.           | By T-P. only.                                  |
| 656H          | 5           | 50,000       | 8.30         | By C and M when Knob is set by Stop.           | By Knob at all times.                          |
| 600           | 5 1/8       | 50,000       | 13.00        | By C and M except when Latch is dogged by T-P. | By C and M except when Latch is dogged by T-P. |
| 770H          | 4 3/8       | 50,000       | 10.80        | By C and M except when Latch is dogged by T-P. | By C and M except when Latch is dogged by T-P. |
| 790           | 5           | 50,000       | 10.50        | By C and M when Knob is set by Stop.           | By Knob at all times.                          |
| 1442M         | 5           | 2,400        | 6.90         | By Knob and Key.                               | By Knob and Key.                               |
| 1500M         | 4 1/4       | 1,920        | 4.00         | " " " "  | " " " "  |
| 2330M         | 3 1/2       | 1,920        | 3.25         | " " " "  | " " " "  |

DUPLEX LOCKS.

|      |       |        |         |  |   |
|------|-------|--------|---------|--|---|
| 6614 | 6 1/2 | 50,000 | \$22.25 | By C and M.                                    | By C and M.                                 |
| 6615 | 6 1/2 | 50,000 | 20.25   | " " " "  | By C only.                                  |
| 6616 | 6 1/2 | 50,000 | 18.25   | " " " "  | By Knob only.                               |
| 6274 | 6 1/8 | 50,000 | 16.00   | " " " "<br>when Knob is set by Stop.           | By Knob at all times.                       |
| 6270 | 6 1/8 | 50,000 | 16.75   | By C and M except when Latch is dogged by T-P. | By Knob except when Latch is dogged by T-P. |

\*"C" designates the Change or Guest's key. "M" designates the Master-key. Either of these may be of the Solid or Barrel type. "T-P" designates Thumb-piece.

† Prices are for the lock only, *without* Trim, but *with* Bronze or Brass Front and Bolts.

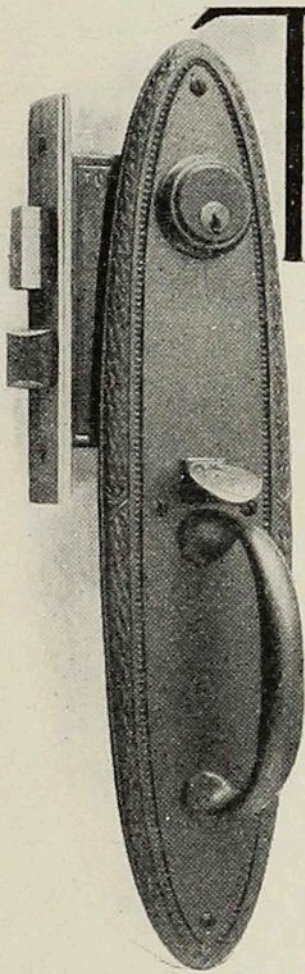
All Office locks have a latch bolt, operated from both sides by the knobs, to hold the door in the closed position and yet permit free ingress and egress, but various methods are employed to lock the door against ingress except by means of the key. In some locks the latter purpose is accomplished by means of a separate dead bolt, operated by key from either side (thus enabling the door to be locked *from the inside* as well as from the outside). In others it is accomplished by the latch bolt only, by providing the latter with "stop-work," like a front door lock, (see page 142), whereby the outer knob may at will be "stopped" so that the latch bolt cannot be operated by it but only by the key, or by a construction whereby the latch bolt may be dead-locked from the outside by the key, so that it cannot be operated by the knob until released by the key. The choice between these various arrangements, or "actions," is entirely a matter of personal preference.

The remarks under table of Hotel locks as to grouping by floors and corridors, and as to use of master and grand master-keys, also apply to table of Office locks.



## Section 12.

### Store Door Trim.



**T**HE technical term "Store Door Lock" originally designated a heavy dead lock, whether rim or mortise, but is now applied also to a combined lock and latch, the latter arranged for operation from either side by a thumb-piece located above a pull handle, as shown by the illustration. Such locks are made in a variety of sizes and styles, the best being of the "cylinder" type, the thumb latch being used during the day and the dead lock serving to secure the door at night.

A Front Door Lock is also made, with its latch arranged for operation by thumb pieces, for use where it is desired to substitute a pair of store door handles for the customary knobs, in which case a night latch action is obtained.

Plates and handles for the combined store door lock and latch are made in a great variety of sizes and styles, from the plain rectangular type to the most elaborate of ornamental forms, and afford large opportunity for effective decoration, as will be appreciated by examining the illustrations in Part V.

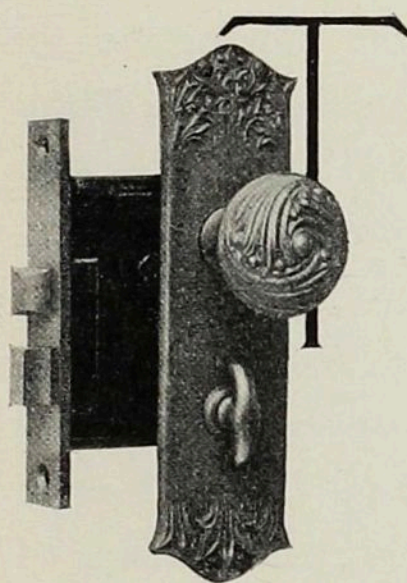
No other embellishment of the entrance doors of a handsome store is so effective as a pair of handsome plates and handles, of appropriate design, and this fact is so well understood that it is

not uncommon for an outlay of from \$25 to \$50 per door to be incurred for this purpose.

The convenient action of the store door lock and latch, with handles and thumb-pieces, has of late led to its extensive use in office buildings as a substitute for the knob lock on corridor doors.

## Section 13.

### Lock "Trim" and Lock "Sets."\*



THE term Lock, as used in the trade, includes only the lock itself, with its keys, the strike, and, usually, the screws for attaching. Any other parts required, such as knobs, escutcheons, etc., are separate items, and are designated collectively as the "trim," or by the older term "furniture."

From the outset most of the Yale locks were packed each in a paper box, complete with screws (which was then an innovation,) and all necessary trim. The practice thus inaugurated was followed later by other lock-makers, and has grown so that it is now customary to pack many kinds of locks in this way. When so packed each constitutes what is termed a "lock-set." Obviously this practice can be applied regularly only to staple goods, as the possible combinations of locks and trim are too vast in number for all to be so treated, but practically the same result is reached as to locks and trim selected by Architects, by putting each lock, with its trim, in a separate package, labeled for the place for which intended.

In the case of Rim locks the usual trim consists of a pair of knobs with knob-roses and key-plates, although combined escutcheons may be substituted for the two latter pieces.

In the case of Mortise locks the trim consists, almost invariably, of a pair of knobs and a pair of escutcheon plates, although there is a tendency in some cases, especially where glass

\*For detailed information see Part V, "Locks in Sets."

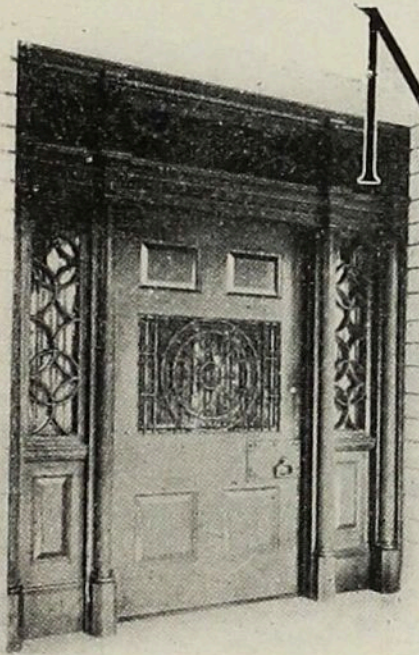
knobs are used, to revert to the older style of knob-roses and separate key-plates or drop-escutcheons.

Except where plain trim is used the selection of trim involves the element of decoration, and this is fully discussed elsewhere, but whether plain or ornamental trim is used the range of quality is a *very* wide one, and the opportunity for intelligent selection correspondingly great. Information on this point is given under the head of "Metals and Finishes," Part III, Section 7, but in addition to what is said there, attention is called to the great divergence in sizes and in weight of material, especially in the case of wrought metal goods, and the resulting variations in cost. In comparing competitive quotations all these factors should be considered, and therefore an intelligent decision can usually be reached only by an inspection and handling of correct samples of the several articles.

For minor work, especially small residences, the commercial lock-sets carried in stock by dealers can be availed of, and will be found to include goods of fair quality, although much of the so-called commercial line consists of light-weight and inferior goods, but for all important work Architects should avail of the far larger assortment of finer and choicer designs included in the catalogues of leading manufacturers, any of which can be supplied by any responsible dealer, and thereby secure a much wider range of choice and of individuality.

## Section 14.

### Hand and Bevel of Doors.



MANY years ago The Yale & Towne Manufacturing Company, finding that no absolute rules then existed whereby to determine the "hand" of doors, formulated, adopted and published the following rules relating to hands and bevels, which, having since been adopted generally by other manufacturers, may now correctly be said to be the established standard of the trade.

Some locks and some butts are available for both right and left hand doors; others are not, and so must be specified as right hand and left hand. In the latter class are loose joint butts, and most locks the operation of which is different on one side from the other, such as front door, hotel and office locks, certain room door locks with thumb-bolts, and nearly all master-keyed locks.

#### RULES.

1. The hand of a door is always determined from the *outside*.
2. The "outside" is the street side of an entrance door, the corridor side of a room door, and the room side of a closet door. The outside of a communicating door, from room to room, is the side from which, when the door is closed, the butts are *not* visible. The outside of a pair of twin doors is the space between them. This rule applies to *sliding* doors as well as to doors hung on hinges.

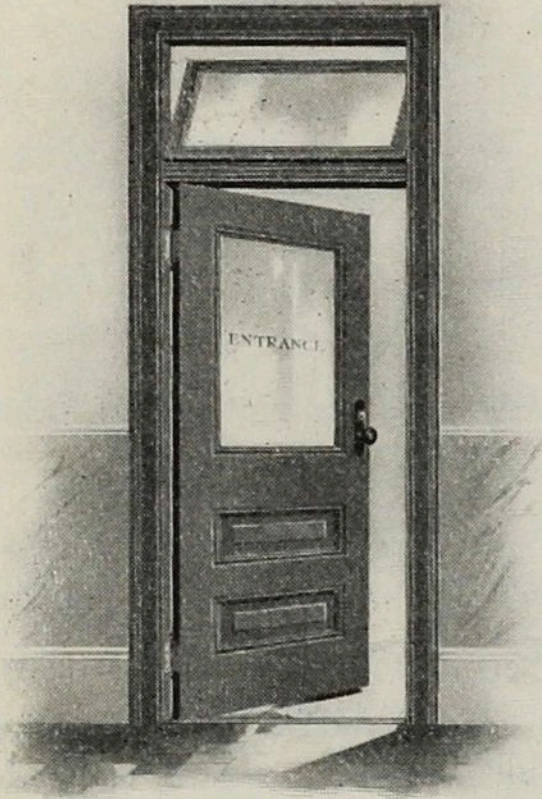


Fig. 2.

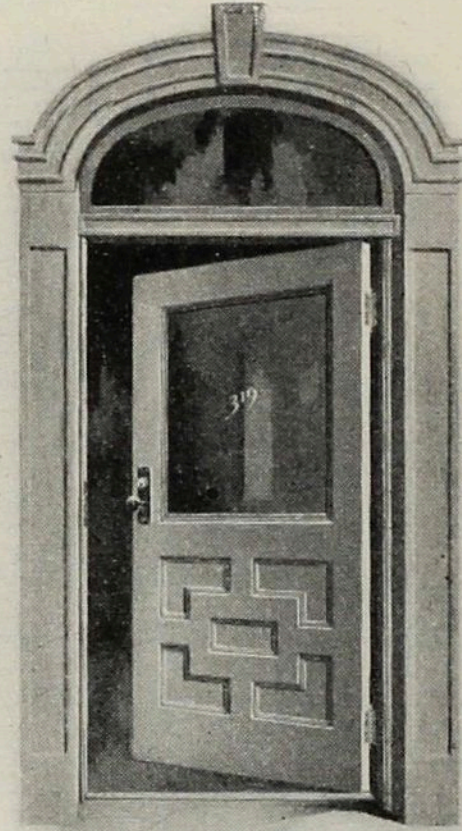


Fig. 1.

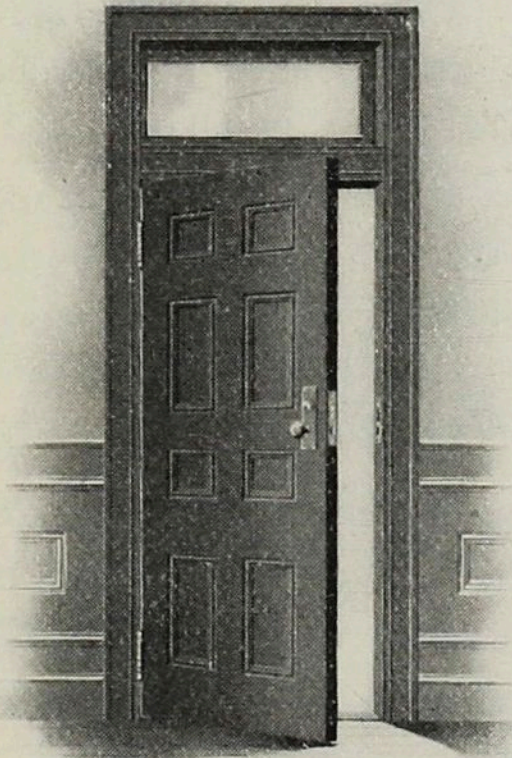


Fig. 4.

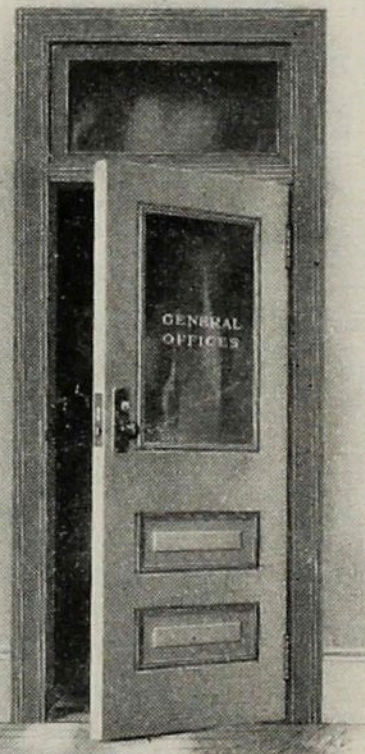


Fig. 3.

Fig. 1. Right hand Door opening *in*; takes right hand lock *regular* bevel.  
 " 3. " " " " *out*; " " " " *reverse* "  
 " 2. Left hand Door opening *in*; takes left hand lock *regular* bevel.  
 " 4. " " " " *out*; " " " " *reverse* "

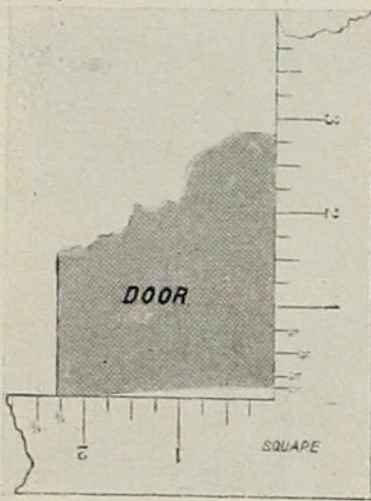


Fig. 5.

3. If, standing outside of a door, the butts are on the right it is a right hand door, if on the left it is a left hand door.

4. If, standing outside, the door opens from you, or inward, it takes a lock with *regular bevel* bolt, and if opening outward it takes a lock with *reverse bevel* bolt.

5. A door is "beveled" when its edge is not at a right angle with its surface, and in this case the front of a mortise lock must be beveled to correspond. This bevel is expressed by stating the thickness of door and the distance which one edge drops back of the other. The standard bevel is  $\frac{1}{8}$  inch in  $2\frac{1}{4}$  inches. (Fig. 5.)

6. The bevel of a *lock* is a term used (both with mortise

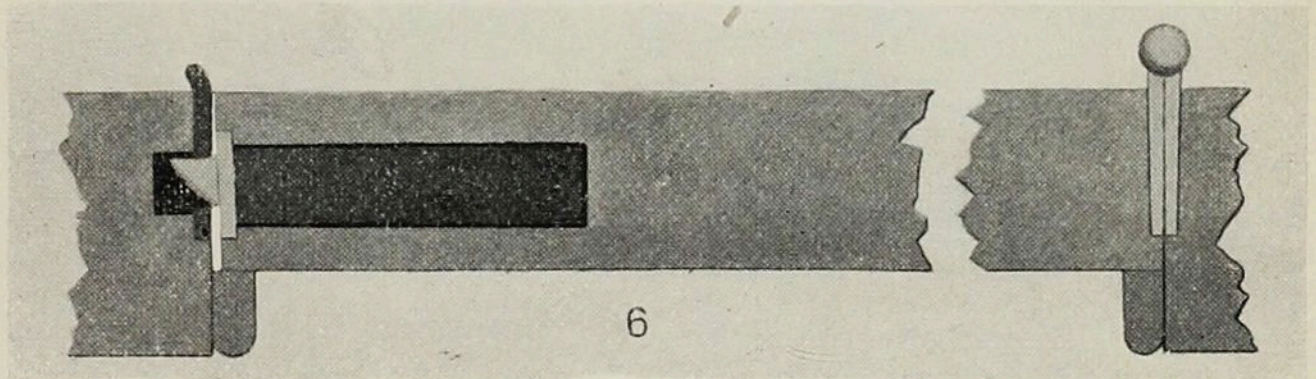


Fig. 6.

and rim locks) to indicate the *direction* in which the bevel of the latch bolt is inclined. If inclined outward, as for doors opening inward, it is a *regular bevel* (Fig. 6); if inclined inward, as for doors opening outward, it is a *reverse bevel* bolt. (Except as to Cabinet Locks, which, being commonly used on doors opening outward, are regularly made with reverse bevel bolts, unless otherwise specified).

Mortise locks used with double doors having either *rabbeted* or *astregal* joints require to have fronts of corresponding sectional form. To avoid the extra cost of special patterns the edges or

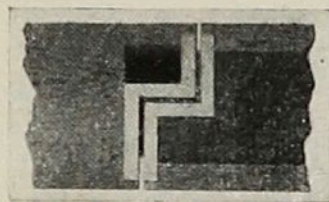


Fig. 7.

joints of such doors should conform to established lock standards. The standard rebate is *one-half inch*, as shown by Fig. 7, and the

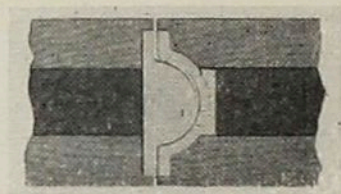


Fig. 8.

standard astragal joint has a *three-quarter inch* bead (the groove to receive it being slightly larger) as shown by Fig. 8.

The proper bevel of a door, if any is needed, is determined by the size of butt and the width of door, as shown by Fig. 9. The inner corner B of the door travels on the radius A B, and must have a clearance equal to the *versed sine* of the arc B C. This may be obtained by beveling the edge of the

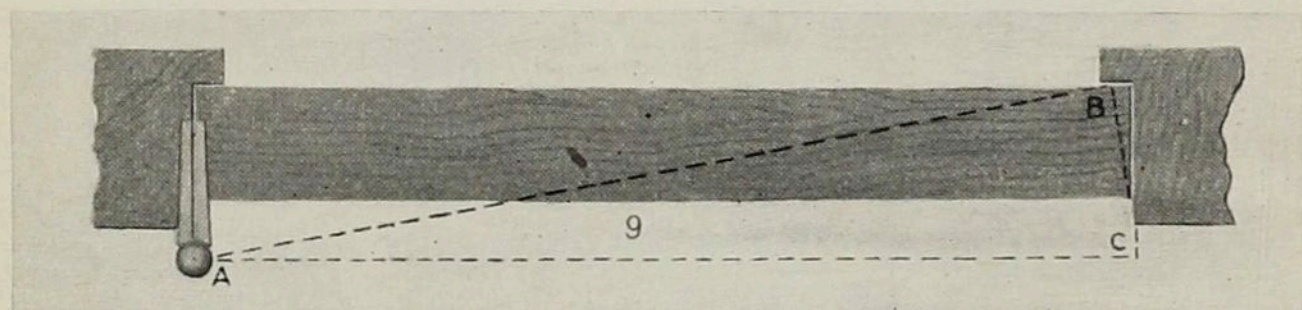


Fig. 9.

door or, if its edge is left square, by leaving sufficient clearance between the door and its jamb. If the door is of fair width, and if the butt does not need to be very wide, (to clear the architrave), it will be found that a square edge may be used without resort to an unduly open joint, thus permitting the use of a lock with regular front, (i. e. *not* beveled). The use of beveled front locks should be avoided where no real need for them exists.

This depends on the relative positions of the points A, B and C, and by plotting these the question can be settled definitely, and better than by leaving it to the varying judgments of contractors or their workmen.

A "reversible" lock is one having a beveled latch bolt which can be turned over, or "reversed," to make its bevel face in



the opposite direction, and thus to convert it at will to either a right hand or a left hand lock. Formerly many locks were made with a "slide reverse," that is so that, by sliding some piece (or the bolt itself) while the lock was in hand, the bolt could be turned over quickly. All devices of this kind tend to weaken and complicate the lock, for a trivial and transient convenience, and have generally been abandoned, except in cheap rim locks. The reversing of the bolt, where desirable, is best accomplished by removing the cap of the lock, and locks so made are said to have a "cap reverse."

The strike of a *mortise* lock is the same whether for regular or reverse bevel. In the case of a *rim* lock, however, the two are quite different, as will be seen from the accompanying illustrations of a rim night latch, Figs. 10 and 11.

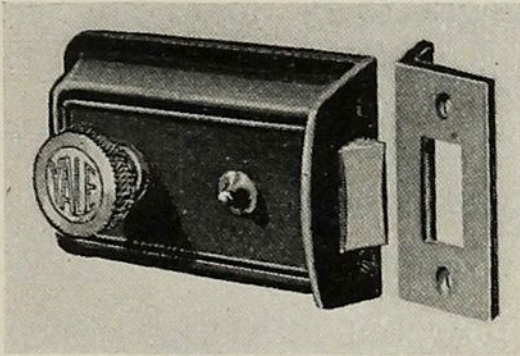


Fig. 10.

Right hand door, opening *outward*;  
requires *reverse* bevel bolt and strike.

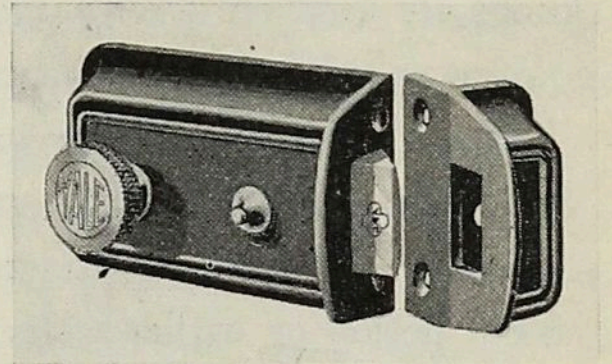
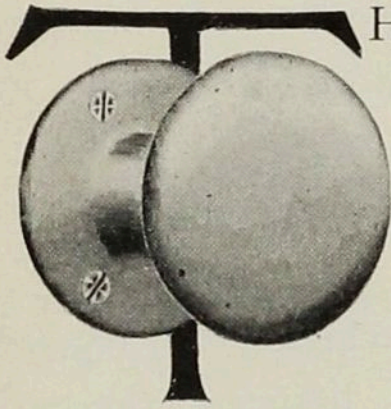


Fig. 11.

Right hand door, opening *inward*;  
requires *regular* bevel bolt and strike.

## Section 15.

### Knobs and Spindles.



THE Knobs used with Builders' Locks may be broadly classified as follows :

POTTERY KNOBS.—These have tops made of clay, the *three* usual kinds being designated as “Mineral,” a tawny brown, irregularly striped ; “Jet,” a deep black ; and “Porcelain,” a pure white ; all highly glazed.

The “mountings” (*i. e.* shanks and roses), are usually of cast iron or plated steel, but may be of real bronze or brass. Such knobs are used only with the cheapest grades of locks and are seldom called for by Architects.

WOOD KNOBS.—These have tops of various kinds of hard wood, in natural finish, with “mountings” of any metal desired. Although considerably in vogue during the “Eastlake” period of earlier years they are now but little used except in buildings of the cheaper class, probably because the contrast they offer to the wood of the door on which used is less pleasing and effective than that of metal or glass knobs.

CAST IRON KNOBS.—These are largely used with cheap locks, and are usually ornamented. They are serviceable but rarely attractive, and are not often used by Architects. An exception is a heavy knob, entirely plain, finished by the Bower-Barff process, well made and often used on good work.

COMPOSITE (BUILT-UP) METAL KNOBS.—This is a large class which has come into very extensive use, and which includes some very good, but more indifferent, kinds. The motive in all cases is to use a cheap material (iron or steel) for the main

structure and to cover this, wholly or in part, with a veneer of bronze or brass. Too frequently quality is sacrificed to cheapness and the result is a very poor knob. The variations are many, but a safe method of selection consists in sawing a knob in two (which can quickly be done with a common "hack-saw" by any dealer or locksmith) and in then examining its structure. No expert knowledge will be needed to detect the trashy article by this plan. There are some composite knobs, however, which are thoroughly good and can properly be utilized in many places. Many of the cheaper bronze knobs used with commercial lock sets have a cast iron shank covered with a thin bronze "skelp" or veneer.

**REAL BRONZE AND BRASS KNOBS.**—These constitute the best grade of door knobs, and are always used in buildings of the better class. All ornamental knobs of the higher grades are of this kind. Differences in weight and finish exist and should be noted. The best knobs of this kind are usually "Solid," that is cast in one piece, (except that the shank may be inserted), but others are made in two pieces joined together in various ways. If this is well done the knob may be good, but the solid knob is to be preferred. An exception, in the case of plain knobs, is the construction employed in the Yale & Towne No. 56 knob (see Part VI), which consists in the use of an interior shell or frame of wrought steel, over which is tightly drawn an external skin or covering of wrought bronze (or brass) of substantial thickness, the completed knob being actually stronger than a cast knob, and much more resistant to bruising or other injury. In this case the composite knob is even better than one of cast metal and costs as much.

**GLASS KNOBS.**—These have glass tops with metal mountings. If properly made they are very handsome and somewhat expensive, this depending, however, on the style and amount

of cutting. If of plain pressed glass the cost is moderate, but much finer effects are obtained with cut glass and prices vary accordingly.

The old method of mounting the glass top was very clumsy and provided no means for adjusting the knob to doors of varying thicknesses, each knob being riveted to its spindle. Some years ago the Yale & Towne Manufacturing Company devised means for overcoming these objections, and introduced the line of glass knobs shown in Part VII, the essential features of which have since been reproduced by other makers. In this form glass knobs are as available and reliable as any others, and in appropriate places are very handsome and effective, especially in connection with work in the Colonial School.

If used they should be selected and specified with care in view of the great difference in quality and prices which exists.

LOCK SPINDLES.—Knobs are always priced by the *pair*, and a pair of knobs always includes the spindle which connects them with each other and with the lock.

Until lately all lock spindles were of the type shown by

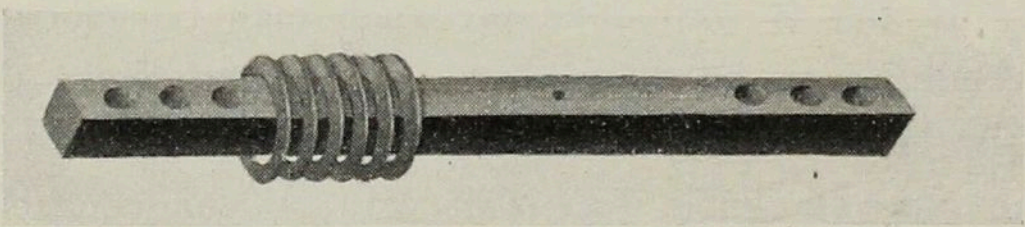


Fig. 1. Solid (or Side-Screw) Spindle.

Fig. 1, and this form, known as the “common” or “side-screw” spindle, is still in almost universal use, although a crude and unsatisfactory device. One knob, or both, is secured to the spindle by a side-screw passing through a hole in the knob shank and engaging with the one of the threaded holes tapped in the spindle which happens to come nearest to the proper adjustment, the remaining adjustment being accomplished by placing one or more thin “washers” under the end of the knob shank.

The general looseness and rattle of this crude device, and the provoking tendency of the side-screw to work loose and drop out, are annoyances so familiar and long-established that they have been regarded as unavoidable evils. They are no longer such, however, and no specification for hardware should fail to bar them out.

As far back as 1878 the Yale & Towne Manufacturing Company attempted to solve this problem and coined the word "screwless" to designate the improved spindle which it then brought out. This first device, however, proved unsatisfactory and was withdrawn. Experiments were continued to find a satisfactory method, with the result that a thoroughly good

screwless spindle and knob was perfected and put into use about 1881. This consisted of a chuck or vise formed on the knob-shank which, when tightened with a wrench, gripped the spindle securely, the latter being solid and without screw holes. While mechanically perfect, and still used when a customer is willing to pay a little more in order to have the very best article, this "clutch-knob-shank" was too

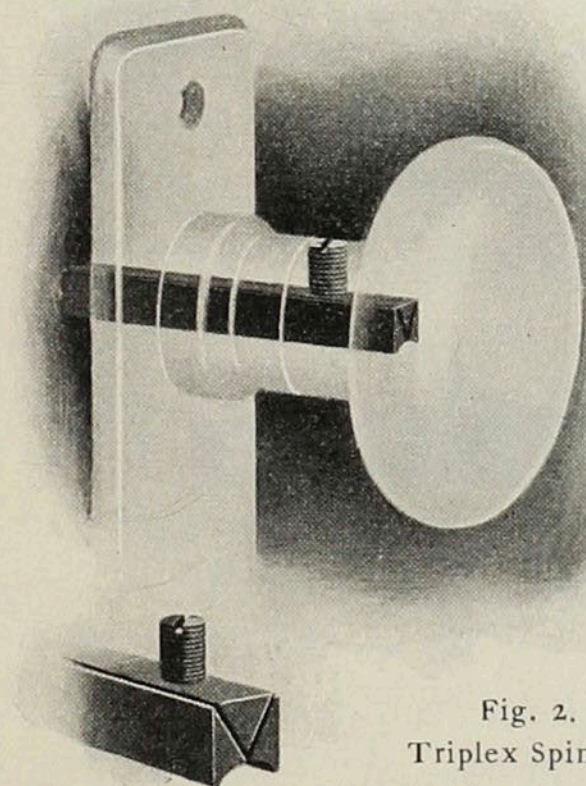


Fig. 2.  
Triplex Spindle.

expensive for general commercial use. Therefore experimentation was again resumed, with the result that in 1890 the Company brought out the patented "Triplex spindle," (Fig. 2), now used with almost its entire line of locks and knobs, and furnished at equal price with the old "common" spindle.

As shown by Fig. 2 the Triplex spindle consists of three

parallel bars, which together form a square rod. A set screw in the knob-shank bears on the center bar, and the wedge form of this forces the two other bars apart and into frictional engagement with the knob. The spindle itself is "screwless," and no tendency exists to loosen the set screw, so that when once properly tightened it will so remain under all conditions of use.

The Triplex spindle, like other improvements in the mechanic arts, has been opposed by ignorance and prejudice, but it has long since passed the experimental stage and demonstrated its value, more than ten years having elapsed since it was first introduced, and many millions being now in successful use. It is the only device which, without increased cost, has successfully overcome the defects and annoyances of the old type of side-screw spindle.

**THE SWIVEL SPINDLE.**—This is a spindle used with Front Door and Vestibule locks which have a "stop-work" whereby at will the outside knob may be made operative or not. To accomplish this the spindle is divided longitudinally, so that one end may rotate independently of the other, as shown by Fig. 3.



Fig. 3. Triple (Swivel) Spindle.

**SIZES OF SPINDLES.**—There are two standard sizes of lock spindles, known as the  $\frac{5}{16}$  and  $\frac{3}{8}$  inch sizes. These dimensions, however, indicate the size of the holes in the lock hubs, through which the spindles pass, the actual sizes of the spindles being respectively .28 and .36 inch. Spindles of  $\frac{1}{4}$  inch size are used for thumb knobs, and of  $\frac{1}{2}$  inch size occasionally for very large knobs or handles. Swivel spindles should not be smaller than the  $\frac{3}{8}$  inch size.

## Section 16.

### Butts.



N

THE field of Hardware no article deserves more consideration, and receives less, than the Butt or Hinge. It carries the whole weight of a door and is in constant use, the resulting friction of its parts and the varying strains to which they are subjected all tending to produce wear and disturbance.

Therefore, butts of proper size and quality should always be used, and economy, if needed, be sought elsewhere than in the use of cheap and inferior butts, of which, unfortunately, there are many. The various kinds available are as follows :

**CAST IRON BUTTS.**—These are the cheapest and least durable, and should only be used where economy in first cost is the controlling factor. They are made in all finishes, including bronze plate, the latter being difficult to distinguish from solid bronze. A heavy cast iron butt, of good quality, is also made for use where the Bower-Barff finish is desired.

**WROUGHT STEEL BUTTS.**—These are excellent mechanically, and are thoroughly appropriate for a wide range of uses. The material insures strength and durability, and adapts itself to all kinds of finishes, especially to bronze plating. Steel butts are made in various qualities and of different thicknesses, so that care is needed in selecting and specifying them. They are especially available where the Bower-Barff finish is desired.

**CAST BRONZE (AND BRASS) BUTTS.**—These constitute pre-eminently the highest grade of butts, and are nearly always

adapted for important work, except where the Bower-Barff finish is wanted, in which case a heavy cast iron butt or a steel butt is substituted. No other article offers so much temptation, and so much opportunity, for departure from specifications as a bronze or brass butt, because of the great range in quality and the difficulty in determining the quality after a butt has been put into position.

Competition in prices has reduced the thickness of metal in the commercial bronze butt to a degree which has led to the nicknames "razor-edge" and "brown-paper" to designate the attenuated article, and rigid specification and inspection are needed to guard against the substitution of these for butts of proper weight and quality, but with these precautions no difficulty exists in obtaining good bronze and brass butts. These are of two grades, the heaviest and best being represented by Y. & T. No. 750 (Fig. 5, page 178), and the second by Y. & T. No. 780 (Fig. 6,

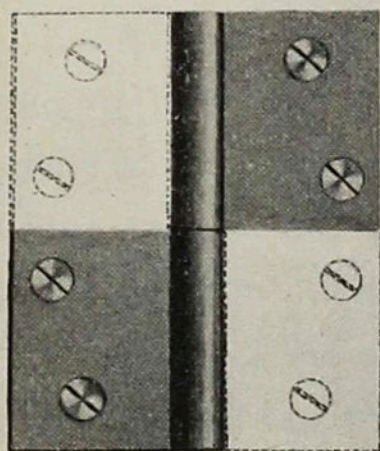


Fig. 1.

page 178). The first of these should be availed of for all important work, while the second is appropriate elsewhere, and, being lighter, is somewhat cheaper. *No lighter or inferior grades should ever be used.* If further economy is desired the steel butt, bronze or brass plated, should be availed of and is far better than a "razor-edge" cast bronze butt.

Ornamented butts involve considerable extra cost, the ornament is little seen and not effective, and their use has wisely been abandoned.

Butts vary in mechanical construction as well as in material, the leading types being as follows :

**LOOSE Joint BUTTS.**—As the name implies, these can be



slipped apart, and a door hung on these butts can be lifted off its hinges when open. This is practically the primitive hinge,

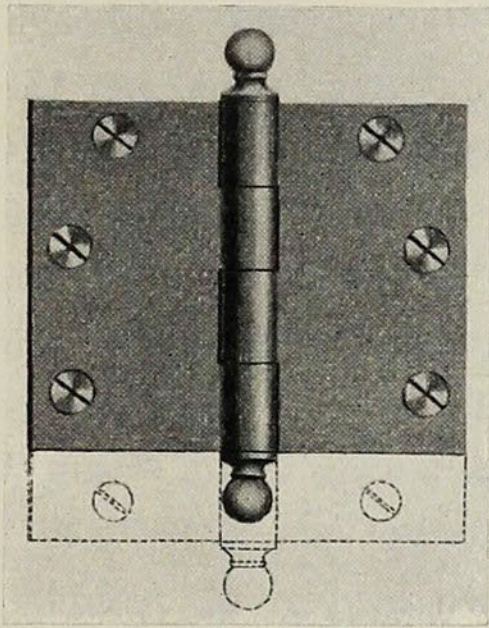


Fig. 2.

represented by the shaded part of Fig. 1 on opposite page, with the unshaded part added for symmetry and to give room for more screws. Each butt presents only *one bearing* to carry the weight of the door and receive the resulting wear, the pin being fast in the lower part. They are cheaper but not so good as butts with more bearings. They are *not reversible*; that is, a right hand form

and a left hand form are both required. This is the cheapest style of butt hinge, and its use is limited accordingly.

**LOOSE Pin BUTTS.**—In these the pin is loose and can be withdrawn to permit the door to be unhinged, thus making them the most convenient to apply and to use.

Obviously either leaf is equally capable of supporting the other and hence this butt *is reversible*; that is, the same form answers for both right and left hand use. They should always have at least *five* knuckles as shown by the dotted lines in Fig. 2, and by Fig. 3, in order to have *two* bearings, whichever is the supporting leaf. Some cheap loose-pin butts have only four knuckles, as shown by the shaded part of Fig. 2, but these are no better than three knuckles, as in either case only *one* bearing is assured.

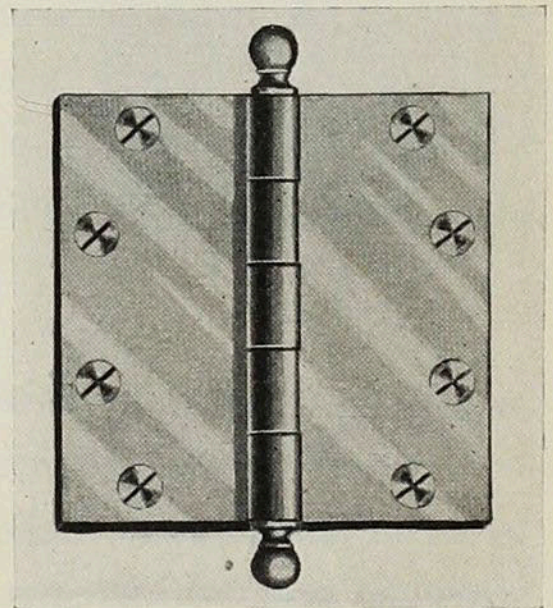


Fig. 3.

The loose-pin butt is the type now generally used for all purposes. A troublesome feature heretofore has been the tendency of the loose pin to "creep" up, which, although rarely involving danger, is unsightly. Some years ago the Yale & Towne Manufacturing Company introduced a "holdfast" pin which remedies this fault. As similar devices have since been adopted by other makers no difficulty exists in obtaining butts with this improvement, which entails no extra cost, if insisted on. All Y. & T. butts of the better grades have the "holdfast" pin. These butts always have "tips," to enable the loose pin to be withdrawn.

**FAST JOINT BUTTS.**—These, as shown by Fig. 4, resemble the butts just described, except that the pin, instead of being loose, is permanently riveted in, so that in order to unhinge a door one leaf or the other must be unscrewed from the wood. Owing to this inconvenience they are now very seldom used, except for cabinet work.

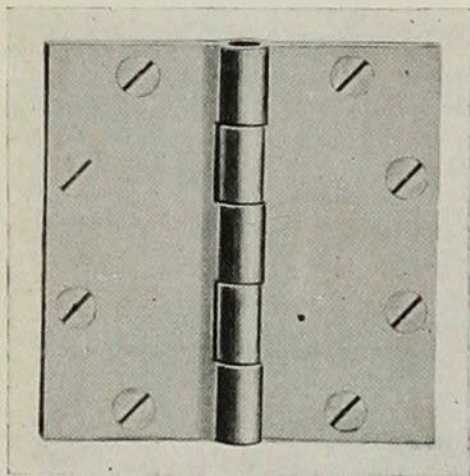


Fig. 4.

Other special forms of butts are made to meet special conditions, illustrations of which will be found in Part VI. Standard butts for Builders' use are always *square*, that is the height and width of the butt, when open, are equal. When greater "throw" of the door is needed, (in order to clear a heavy trim or architrave), either a larger butt must be used or one of irregular size, with greater width than height, at some extra cost.

In butts, as in locks and nearly all other Hardware, where two dimensions are given the first always indicates *height* and the second *width*. Thus a 5 × 6 inch butt is 5 inches high by 6 inches wide.

Various devices have been adopted to diminish the friction and wear on the bearings of butts, and thus to prevent the resulting sagging of doors and need of readjustment of the butts after long use. All good butts made of bronze or brass are "steel bushed;" that is, provided with steel washers to resist the wear. If these are well made they are effective, but some of them are shams. The best, as in the Y. & T. butts, are "self-lubricating," being provided with pockets which contain a permanent lubricant. A later, but expensive improvement consists in a "roller-bearing," which can be introduced in any good butt if called for, but which as yet has not been largely used.

In selecting and specifying butts, next to reliance on the name and repute of the maker, the chief point is to make sure of obtaining the proper weight and strength. This can best be done by the use of catalogue numbers, but when this is deemed inexpedient the *weight per pair* should be specified. The difference in this respect, between butts of various grades, is shown by Figs. 5, 6 and 7, on next page, 178, which are introduced to emphasize the statement previously made that rigid specification and inspection are more necessary in the case of butts than of any other item of Builders' Hardware. The weights there given are per pair of 5 × 5 inch butts, without screws.

All doors require at least one pair of butts, that is two hinges. On doors over 7 feet high or 4 feet wide three butts ( $1\frac{1}{2}$  pair) should be used, and they are desirable even on smaller doors. The size of butts depends upon the size and weight of door and the number of butts used. The  $4\frac{1}{2}$  and 5 inch sizes are those chiefly used for ordinary interior doors, and the 5 to 6 inch sizes for entrance doors.

Strap or surface hinges are now very seldom used, except for

doors of unusual size or weight, because the butt-hinge (technically called a "butt") is mechanically better. Where the architectural effect of a strap hinge is desired, as for example on church doors, it is obtained by using butts of the proper size to carry the door and supplementing them with surface "hinge-plates," for examples of which see Part VII, Section 2.

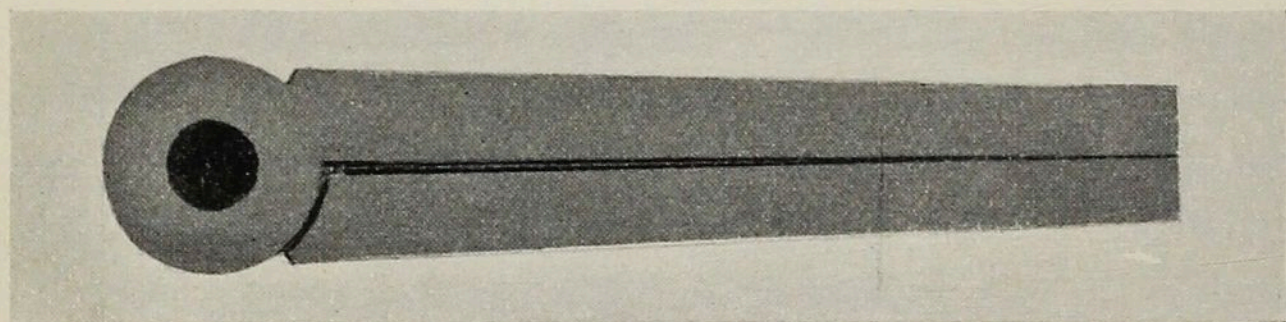


Fig. 5, Y. & T. No. 750. Weight 4 lbs., 5 oz. Full Size Section of 5x5 inch Butt.

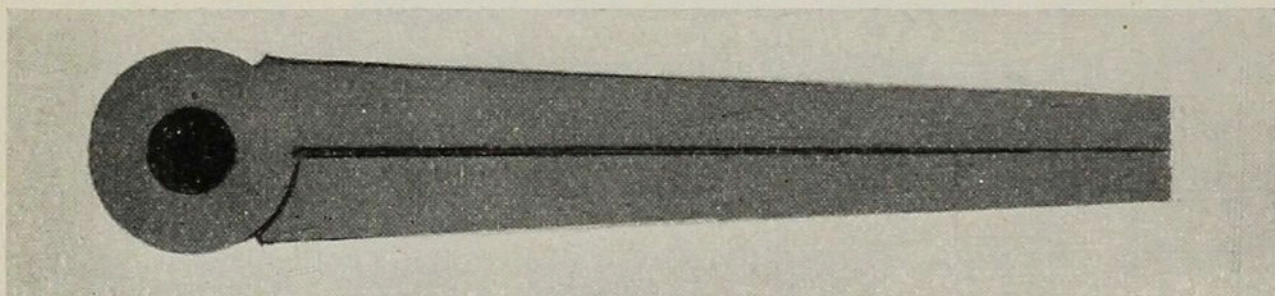


Fig. 6, Y. & T. No. 780. Weight 3½ lbs. Full Size Section of 5x5 inch Butt.

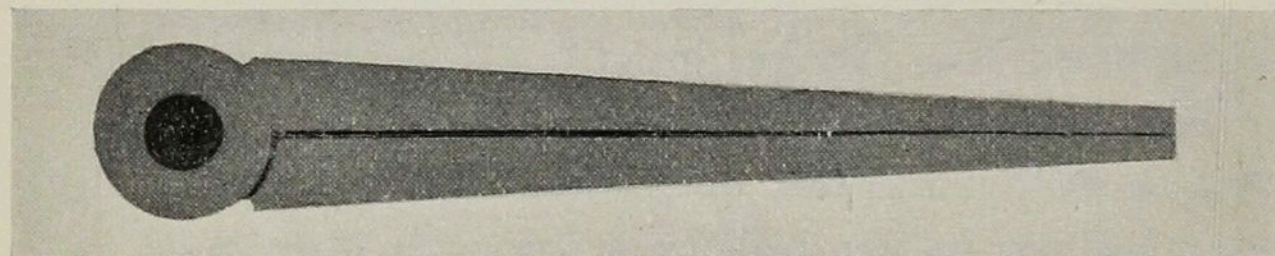


Fig. 7, "Razor-edge." Weight 2 lbs., 4 oz. Full Size Section of 5x5 inch Butt.

Weights given in all cases are per pair, without screws.

## Section 17.

### Door Bolts.

THESE are chiefly used with double doors, to secure the standing leaf or part. Where desired on a single door it is usually preferable to avail of a "three-bolt lock" (see Part IV) which includes a thumb bolt in the same case as the latch bolt and dead bolt. The leading types of bolts are as follows :

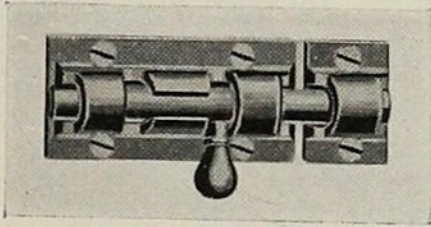


Fig. 1.

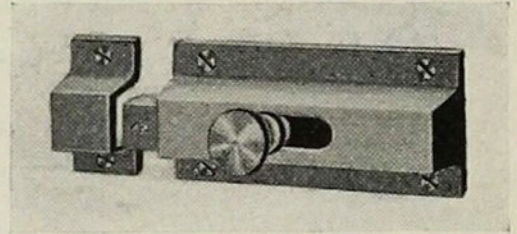


Fig. 2.

**RIM OR SURFACE BOLTS.**—These are not often used except on cheap work. They are of various kinds with round, square and flat bars, boxed and open, and of many sizes, styles and prices. Figs. 1 and 2 are indicative of the type. They are suitable for minor uses, and especially for cabinet work.

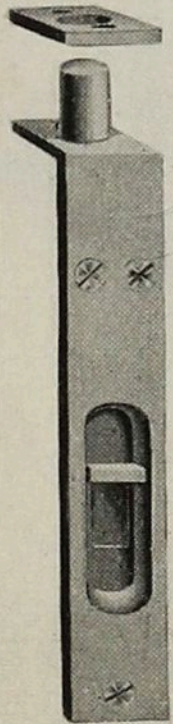


Fig. 3.

**FLUSH BOLTS.**—These are intended to be sunk into a door flush with its edge or surface, and, when not required to be more than eight or ten inches long, are appropriate in many places.

They may be operated by a flush slide, as in Fig. 3, by a knob, or by a pivoted lever, similar to that shown in illustration of Extension Bolt, Fig. 4, which is a greatly improved form recently introduced by the Yale & Towne Manufacturing Company and since adopted also by other makers.

**EXTENSION BOLTS.**—This is the latest and best

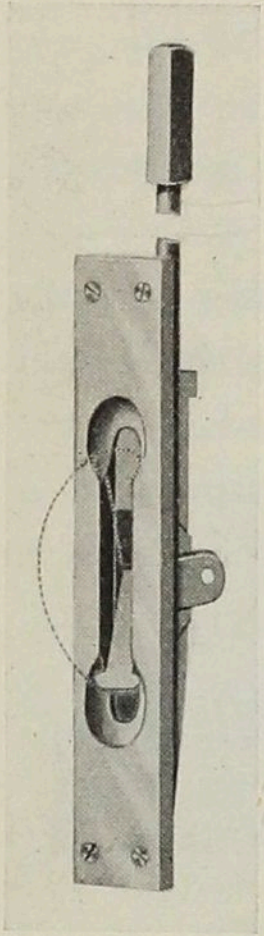


Fig. 4.

form of bolt for large doors and the one which should always be preferred where considerable length is required, because cheaper than a flush bolt of equal length, and still more because it avoids the disfigurement of the door which a very long flush bolt involves.

Where used on the edge of the door it must be operated by a flush slide (similar to that shown in illustration of Flush Bolt, Fig. 3) or preferably by the lever arrangement shown by Fig. 4, but when applied to the inside face of the door it may be operated by a knob or, if of large size, by a turn handle, as shown by Fig. 5.

A variety of bolts for special purposes is made, illustrations of which will be found in Part VI, and an examination of these will be found useful in considering the best method of fastening doors of irregular construction. Under this head may be mentioned Dutch doors, screen doors, book-case doors, etc.

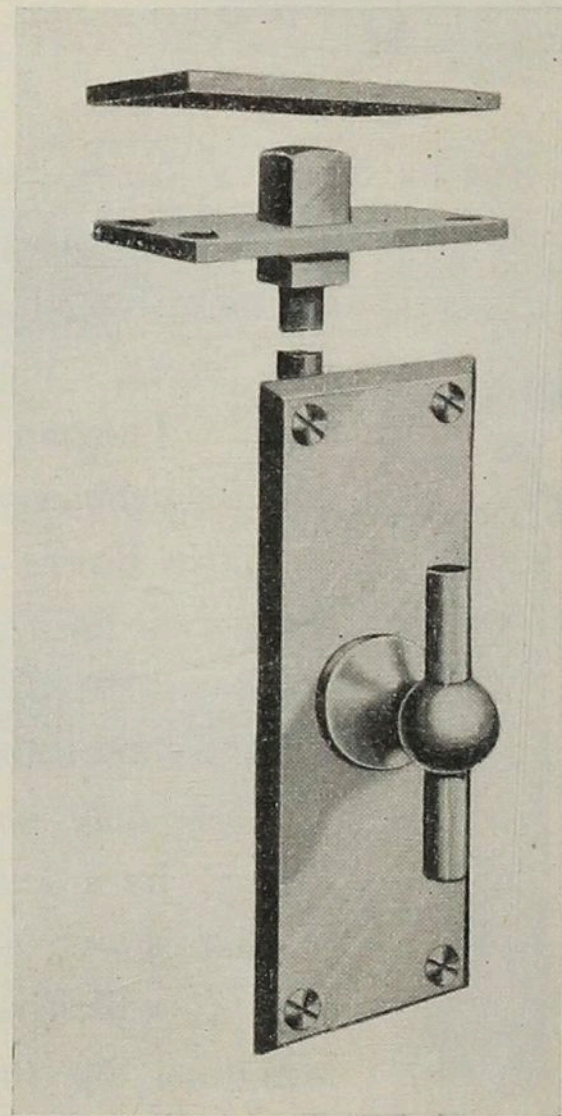


Fig. 5.

## Section 18.

### Sash Trim.

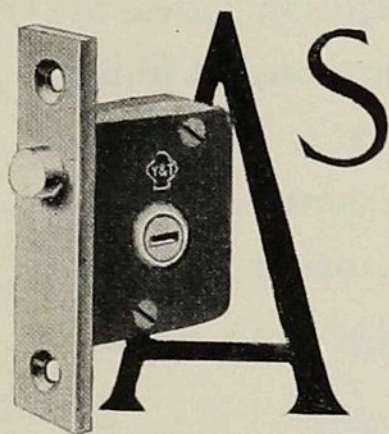


Fig. 1.

COMMONLY used this term covers the hardware for sliding sashes, (known in continental Europe as sashes *à guillotine*), that for hinged sashes falling under the head of "casement" trim. The principal items of sash trim are as follows:

#### SASH (OR FRAME) PULLEYS (Fig. 2).—

These are of the general type shown by illustration, and should be included in the specification for window frames and furnished, in place, with the latter. They are of many kinds and grades and can best be selected by *examination of samples*.

The common grades are rough and cheap, but answer fairly well for light sashes hung on cords. For large sashes, however, of plate glass and hung on chains, pulleys of larger size and better construction are essential and should be specified. Smoothness of motion is increased by requiring the pulley to be *turned*, and ease of motion by the use of those with anti-friction roller bearings. The face

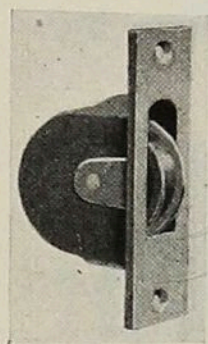


Fig. 2.

of the pulley box, or housing, is usually of iron or steel, intended to be painted with the window frame, but for fine work a pulley with bronze face is often used, the whole construction being of proportionately higher grade and cost.

SASH CORD, CHAIN AND WEIGHTS.—These are all usually covered by the Carpenter Specification, under the head of "Rough Hardware." The cord and chain should be specified both as to size and make, as they exist in various grades.

Where lead weights are necessary, to economize space, attention should be called to the fact in the specification.

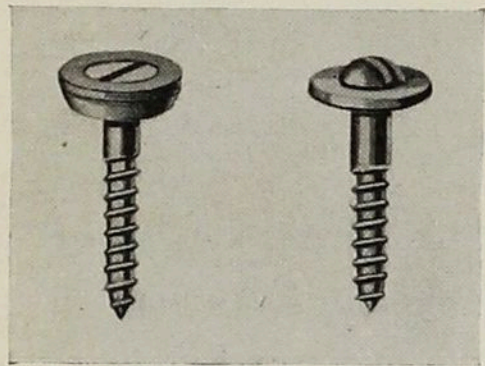


Fig. 3.

STOP-BEAD SCREWS (Fig. 3).—These may be covered either by the Carpenter or the Hardware specification, but are usually included in the latter to ensure harmony of finish with other metal work. The kinds usually employed are shown by illustration, the choice between them being largely a matter of taste.

SASH LIFTS (Figs. 4, 5 and 6).—These are now almost invariably used, even in cheap buildings, and with large single-light sashes are a necessity.

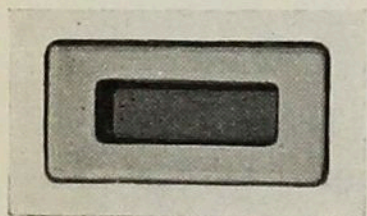


Fig. 5.

The simplest form is the Hook sash lift shown by Fig. 4, which is serviceable

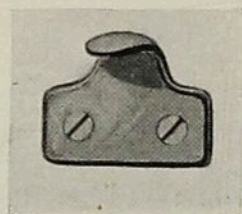


Fig. 4.

but not decorative. A better form, and the one most generally used, is the Flush sash lift, shown by

Fig. 5 and made in great diversity of sizes, shapes and styles. A third form is the Bar

sash lift, shown by Fig. 6, which is the

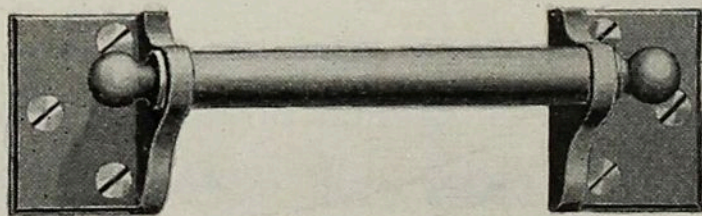


Fig. 6.

most convenient in use, especially for very heavy sashes, such as used in public and commercial buildings.

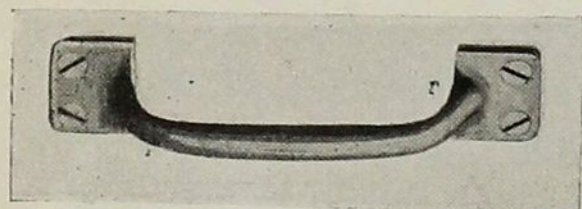


Fig. 7.

PULL DOWN HANDLES (Fig. 7).—Two of these are frequently attached to the under side of the bottom rail of the upper sash; for use in pulling it down, illustration



shows the style usually employed, although for very large sashes a plain bar-handle is sometimes preferred.

SASH-SOCKETS AND PULL DOWN HOOKS (Fig. 8).—Another plan for operating the upper sash consists in inserting a metal “socket” in its top rail, and providing a “hook,” mounted on the end of a wooden rod of suitable length, whereby the sash may conveniently be moved in either direction.

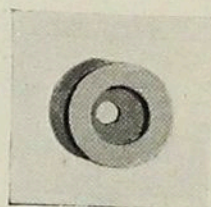
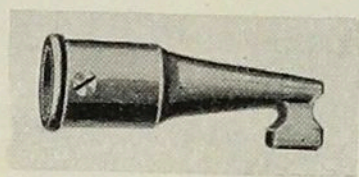


Fig. 8.

SASH FASTS (Figs. 9, 10, 11 and 12).—Of these there is a

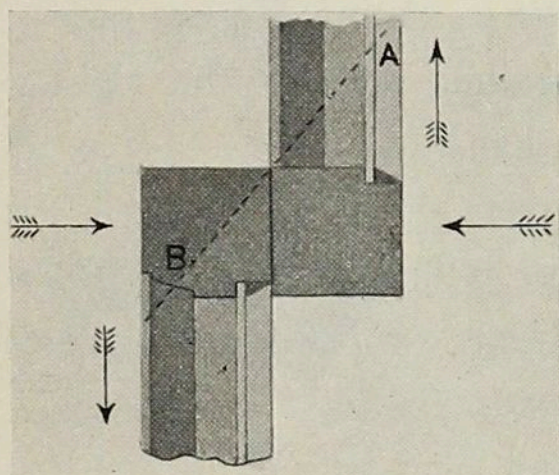


Fig. 9.

great diversity and, therefore, corresponding need of intelligent selection. They have three functions, viz: (1) to furnish protection; (2) to reduce air leaks; and (3) to prevent rattling. To accomplish the first the construction must be such that the Fast cannot be opened by any instru-

ment inserted between the sashes, and all good Fasts are now so made. The other two functions imply that the two sashes must be drawn tightly together horizontally and, at the same time, be pressed in opposite directions vertically, so as to force their ends against the window frame at top and at bottom. The direction of these forces is indicated by the arrows in Fig. 9, and their resultant is obviously the diagonal A-B. Therefore, the more nearly the “pull” of a Sash Fast coincides in direction with this line, and the greater the pressure it develops, the better will it serve its purpose.

Unquestionably the Fast which best fulfills these conditions is the Yale Screw Sash Fast shown by Fig. 10, on following page, in

which the tightening of a thumb-nut on a fine-pitch screw develops strong pressure exactly in the desired direction. The

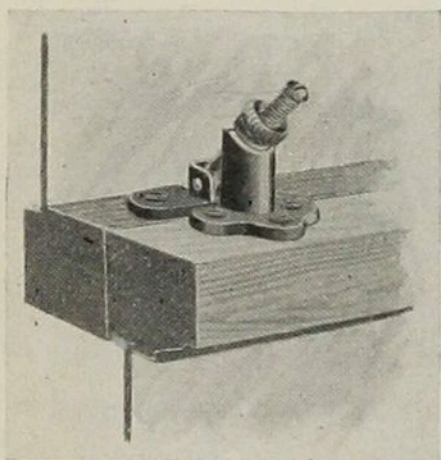


Fig. 10.

great pressure which it develops involves a few moments longer time to operate than Fast which exert little or no pressure on the sashes, but this constitutes no practical objection.

The next best type is that shown by Fig. 11, in which a helical cam on the lower sash engages with a lug on the upper sash in a manner tending at once to draw the two sashes together horizontally and to force them in opposite directions vertically. While this Fast thus acts in the right *direction* it is much weaker in *power* than the one above described, but it operates more *quickly* than the latter. This type is best known by the names of its earlier makers, Ives and Fitch, but it is now made by many others.

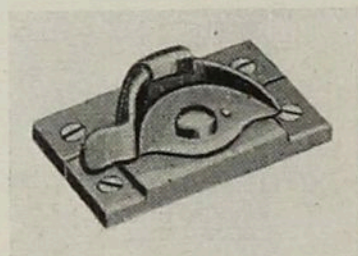


Fig. 11.

Another standard type, still preferred in some localities, is the so-called "Boston" Sash Fast shown by Fig. 12. This is neat in appearance and convenient in action, but otherwise has little to recommend it as it does not develop much pressure, and even this is not right in direction.

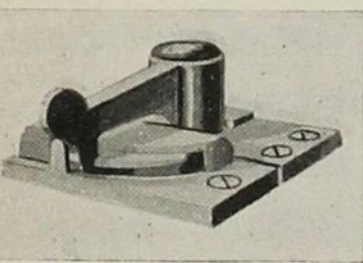


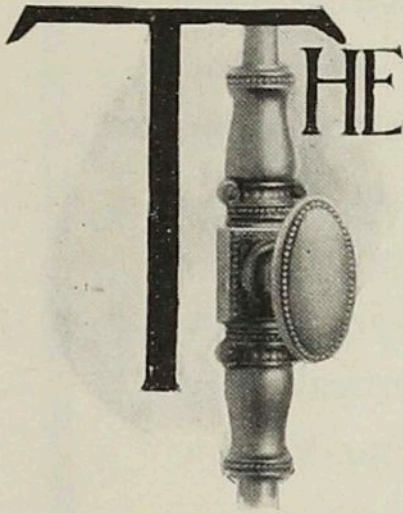
Fig. 12.

Still another device is the Sash *Lock* shown by Fig. 1, (Yale & Towne No. 914), whereby the sash may be locked in any desired position and can only be released by means of the key.

The many other varieties of Sash Fast are usually of inferior design and cheaper construction. Other special appliances for securing sashes are described in Part VI.

## Section 19.

### Casement Trim.



**T**HE Sliding, or “double-hung,” Sash prevails almost universally in Great Britain and her Colonies, and in the United States. In other countries the Casement, or hinged sash, is in universal use and the sliding sash seldom seen.

While the term “Casement” applies properly to any hinged sash, it is usually limited to those which have a sill raised some distance above the floor, the term “French window” being applied to those which extend down to the floor level. The same trim is available in either case.

In Europe a casement window usually has a transom at about one-fourth or one-third the distance from the top, the space below being closed by two main sashes, fully trimmed, and the space above being closed by two smaller sashes which are sometimes hinged at side or bottom, but more frequently fastened permanently in place. In France the sashes almost invariably open inward; in Germany they more commonly open outward.

Experience in European countries has developed methods of framing which best tend to make casements weather-tight, these in turn affecting the details of the hardware, and this experience should be utilized in designing hinged sashes for use here, in doing which the designer should consider both the woodwork and the hardware, and their relation to each other. (See Part X, Section 10 for methods of Casement construction.)

**HINGES.**—To secure a tight vertical joint the axis of the

hinge should be as close as possible to the surface of the casement, and preferably a little outside of its lateral edge. If the vertical joint of the casement and its frame is square, or is undercut on the French plan, regular butts, such as used on doors, are available, but should be narrow in order to bring the axis close to the surface of the sash. The German plan (illustrated in Part X, Section 10) involves the use of a special butt, the axis of which is about one-half inch back from the joint, thus enabling the vertical edge of the sash to be deeply undercut to form a tighter joint.

**BOLTS.**—Any good form of bolt can be used on hinged sashes at the top and bottom, and may be supplemented by a good latch or cupboard catch at the centre, but in the countries where such sashes are regularly used the necessary fastenings have been consolidated into a single structure, the two leading forms of which are described below, the action of one being vertical and of the other rotary.

**THE CREMORNE BOLT (Fig. 2).**—This device consists of a vertical rod, in *two* pieces, divided at or about the middle of its length, operated by a knob or handle at that point, the turning of which by the hand causes the upper and lower ends of the rod, or bolt, to slide vertically, but in opposite directions, and thus to engage with suitable strikes, either of the plate or box form, attached to the window frame at the top and bottom. The ends of the



Fig. 2.

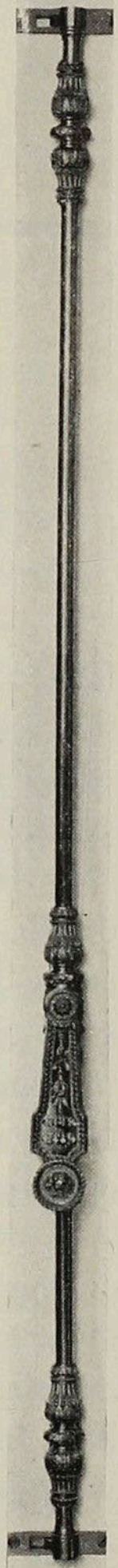


Fig. 3.

bolts being beveled, their motion presses the two sashes tightly together and against the sash frame, a single movement of the knob sufficient to fasten or release both bolts. For very high sashes a supplemental fastening at the centre may be obtained by providing a projecting spur on the bolt which engages with a tapered hook on the opposite sash.

THE ESPAGNOLETTE BOLT (Fig. 3).—This also consists of a vertical rod, put in *one* piece and provided with hooks on its ends to engage, by rotation, with pins or plates in the window frame and thus draw the sashes together and against the frame. It is usually operated by a pendent handle, by which, when lifted to the horizontal position, the rod can be rotated to fasten or release the sashes. For very high sashes a supplemental fastening at the centre may be obtained with this device also by providing a tapered hook on the opposite sash for the pendent handle to engage with, thus supporting it in a horizontal position when the sashes are closed.

The Espagnolette bolt is more expensive, and usually heavier, than the Cremorne, and exerts more power than the latter in forcing the sashes against their frame, for which reason it is somewhat to be preferred, especially for large sashes and doors. Both forms are available for use on *doors*, as well as on windows, and in Europe are extensively so used, especially on entrance doors. Both also lend themselves admirably to decorative treatment, and can be made very effective as elements of ornament. Numerous examples of them are illustrated in Part VII.

CASEMENT ADJUSTERS (Fig. 4, page 188).—These are devices for holding and fastening a casement sash (whether hinged or pivoted) in any desired position. One of them is shown by the illustration as applied to a pivoted casement, but they are made in various styles, for sashes which open inward, for those

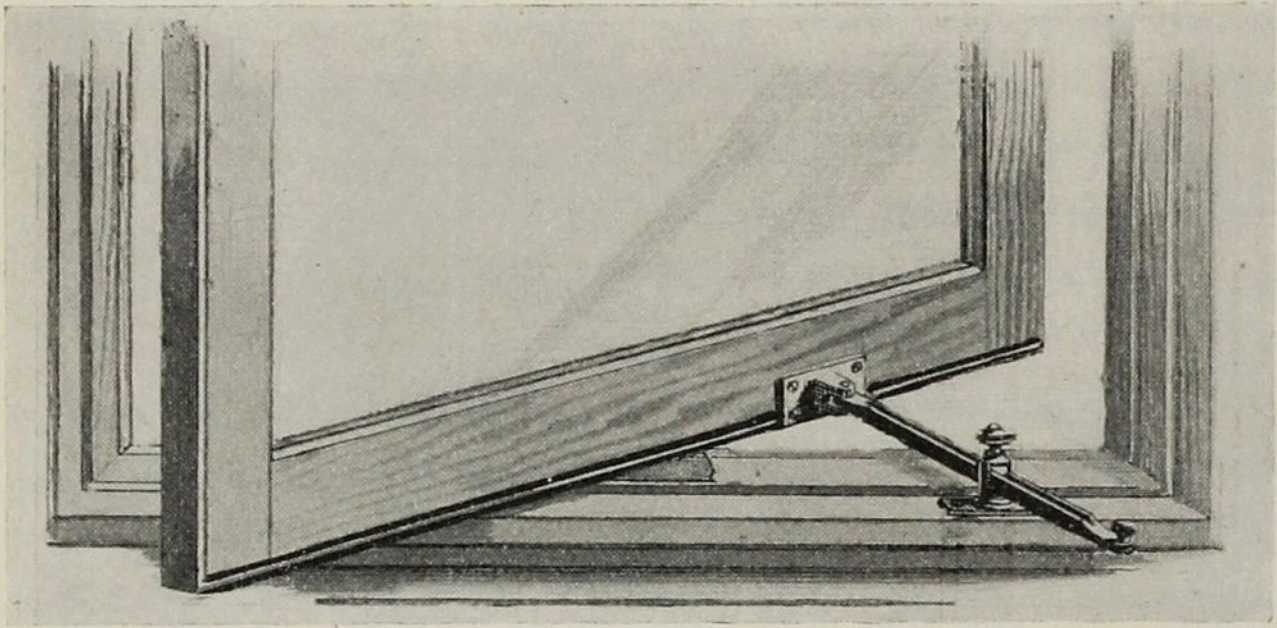


Fig. 4.

which open outward, and to conform to different constructions of the sash and frame. They consist essentially of a rod or bar, attached to the sash by a hinged or pivoted joint, connecting with a clamp on the frame or sill whereby the bar, when the clamp is tightened, holds the sash in any desired position. Illustrations of Casement Adjusters will be found in Part VI.

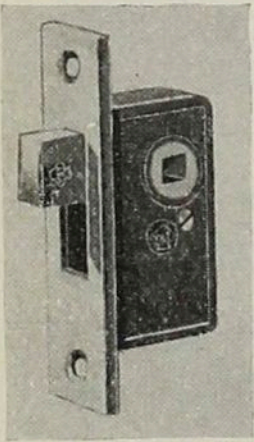


Fig. 5.

CASEMENT FASTS (Figs. 5 and 6).—These comprise various devices for fastening one hinged sash to another or to its frame. The two leading types are shown by Figs. 5 and 6, the former illustrating a

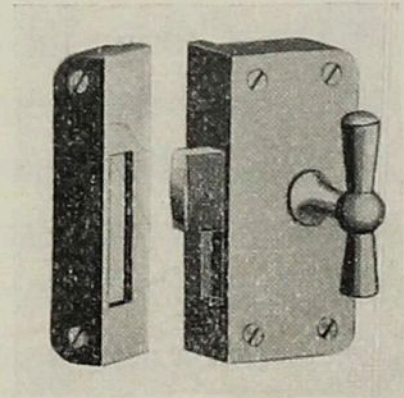


Fig. 6.

*mortise* and the latter a *rim* fast. Other varieties are illustrated in part VI.

## Section 20.

### Shutter Trim.



Fig. 1.

THE general use of the *inside* shutter or “blind” in the older parts of this country has developed hardware for use therewith.

BUTTS.—Three kinds of these are used, according to the number of “folds” in the shutter, and the manner in which they are intended to fold back on each other, viz.: a regular butt (usually fast joint); a back flap, and, where the shutter has three folds, an angle butt, the purpose of which is to cause the folds to take such relative position as will enable them, when open, to close properly into the pocket or recess of the window frame. These several kinds of butts are illustrated by Y. & T. Nos. 150, 50 and 60.

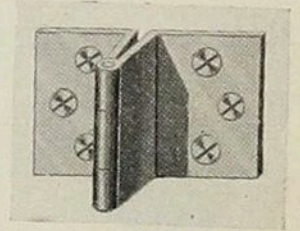


Fig. 2.

SHUTTER BAR (Figs. 1 and 3).—This is a bar pivoted to a plate attached to one leaf of a shutter, and engaging with a stud or hook on another plate attached to the opposite leaf, thus holding the shutters closed (see Fig. 3). Provision is, or should be, made at one end of the bar to allow for the shrinking and swelling of the blind, which is often considerable, because of the amount of wooden surface, and its exposure to sunlight and weather. Shutter bars

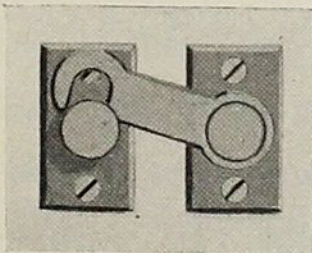


Fig. 3.

are made in great diversity of size, style and quality. As they are little seen a plain, substantial pattern is to be preferred, but they are also made in ornamental designs (see Fig. 1). In the case of blinds having three folds provision must be made, by use of the proper butts, to obtain space for the shutter bar when the blind is folded together, or else a *flush* shutter bar must be used (such as Y. & T. No. 1385).

SHUTTER KNOBS.—These are needed to withdraw a shutter from its pocket, and, being prominent, should be substantial and handsome, but not necessarily decorated, even where the larger hardware is of ornamental character.



Fig. 4.

The simplest form is shown by Fig. 4, and is without base or washer, but the better form includes a base, as shown by Fig. 5, and is always to be preferred, especially as the difference in cost is small.

The use of the *outside* shutter, universal in the case of the typical New England farm house, is still quite common, especially in country houses of the Colonial type, and a great variety of special hardware is made for use therewith. Shutter butts are made both of wrought and of cast iron, the latter being usually the best, but care is needed in their selection, as most of them are of very cheap and flimsy construction.

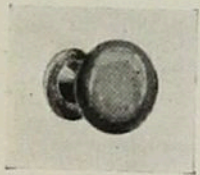


Fig. 5.

As the outside shutter is usually slatted, for ventilation, its fastenings are not intended for protection, but merely to hold it in the closed or open positions. A variety of catches and "fasts" are made for this purpose, but the most convenient are those which secure the shutter in the closed, open and several intermediate positions, among the best fixtures for this purpose being those made by G. F. S. Zimmerman & Co., Frederick, Md. Another available device is a simple casement adjuster,



such as Yale & Towne's No. 2386, and still another, the "shutter worker," made by the Mallory Manufacturing Co., Flemington, N. J.

An increasing tendency exists to substitute for either inside or outside shutters the so-called "Venetian blind." If of the inside type this is operated by cords; if of the outside type it is held in a metal or wood frame (usually arranged so that the blind may be inclined outward from the window at the bottom). In either case no hardware is required.

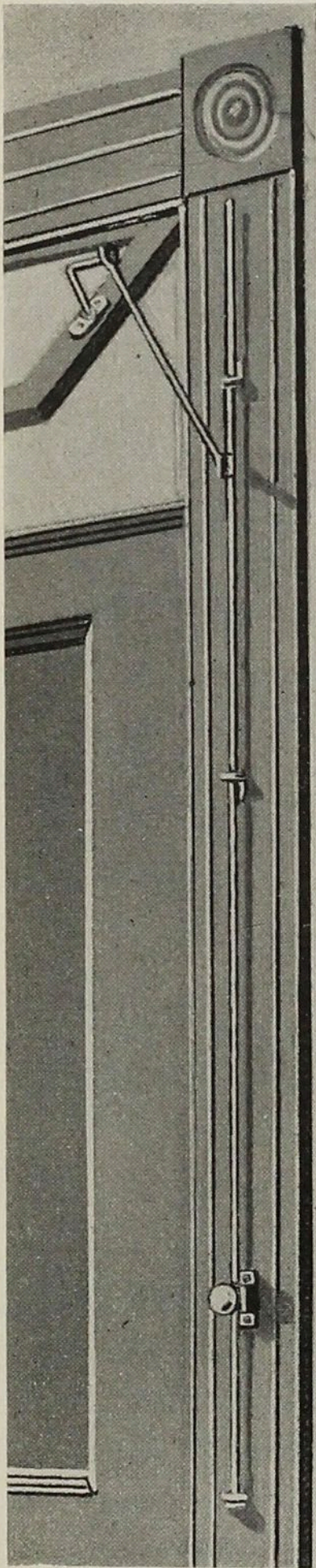


Fig. 1. Top Hung.

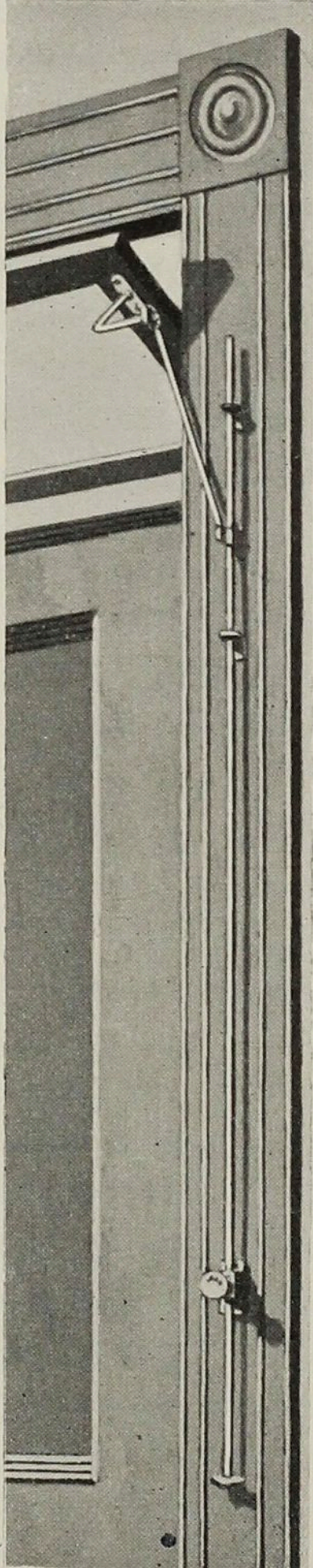


Fig. 2. Centre Hung.

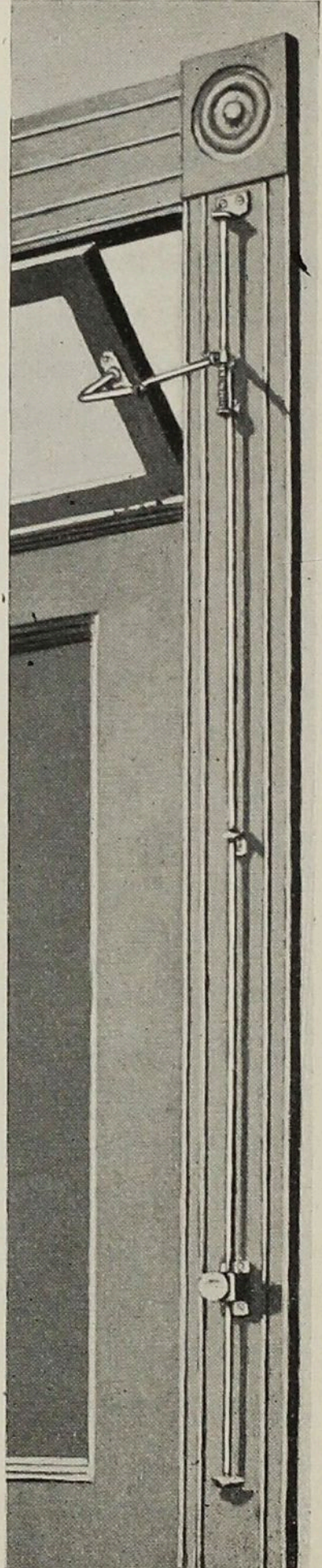


Fig. 3. Bottom Hung.

Types of Transom Lifts.

## Section 21.

### Transom Trim.

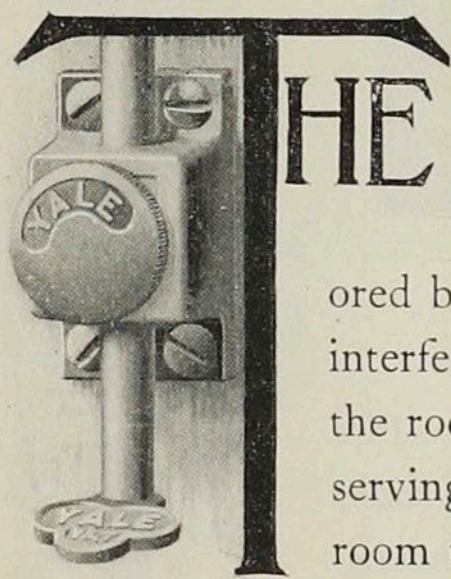


Fig. 4.

THE use of a Transom Light over bedroom doors is peculiarly an American custom, which many think would be better honored by the breach than the observance, because interfering with the control of light within the room at night, and, as a ventilator, because serving more often to ventilate the hall into the room than to improve the air of the latter.

Their largest use is in hotels, but they are legitimately needed elsewhere under certain conditions, and, where used, require special hardware.

TRANSOM LIFT (Figs. 1 to 7).—This is a distinctly American device for operating and fastening transom lights, and was first made by Wollensak, of Chicago, but is now made by nearly all leading manufacturers of Builders' Hardware, as well as by others. It consists essentially of a vertically sliding rod on the door jam, with an arm at the top connecting it with the sash, and a clamp or "grip" (see Figs. 5 and 6) near the bottom, to hold it in any desired position. Vertical movement of the rod causes the sash to swing, the latter being hinged at the top (Fig. 1), centre (Fig. 2), or bottom (Fig. 3) as preferred. The several makes are substantially alike, except for variations in the form of clamp, but the range of size and quality is large, and corresponding care is needed in selection and specification, especially as to size.

The commercial article is made of steel, copper or bronze

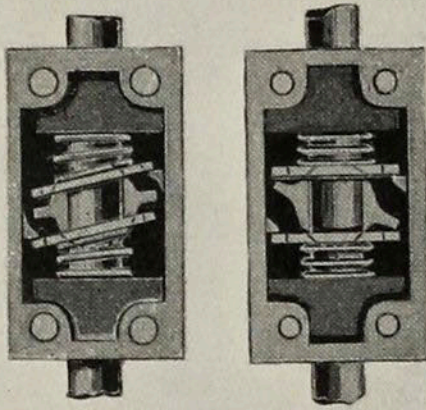
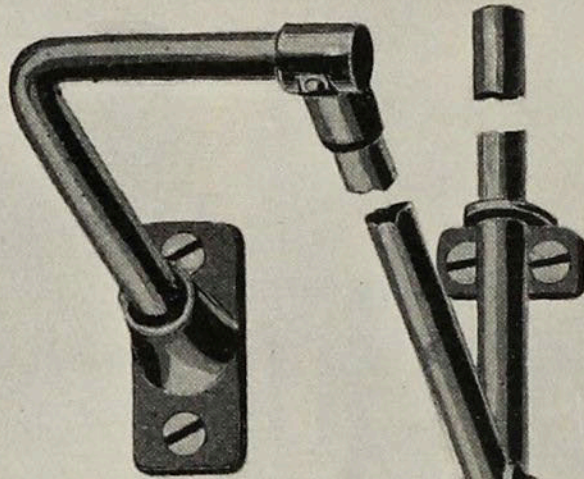


Fig. 5. Fig. 6.

When Locked. When Unlocked.  
Position of Grip.



plated, and in  $\frac{1}{4}$  and  $\frac{5}{16}$  inch sizes. The better grades are made of bronze or brass rods, and in  $\frac{5}{16}$ ,  $\frac{3}{8}$  and  $\frac{1}{2}$  inch sizes. The size should be determined by the size of transom

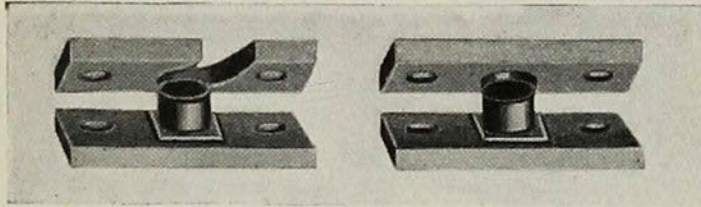


Fig. 8.

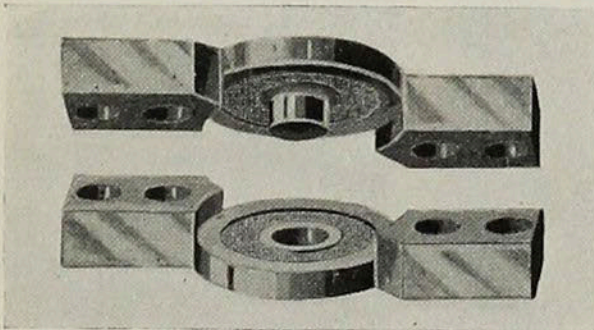


Fig. 9.

of proper size, can be used. Where it is "centre hung," however, as in Fig. 2,

never be less than  $\frac{5}{16}$  inch. For further information see

Part VI.

SASH CENTRES (Figs. 8 and 9)—Where a transom sash is hung at its top or bottom, regular butts,

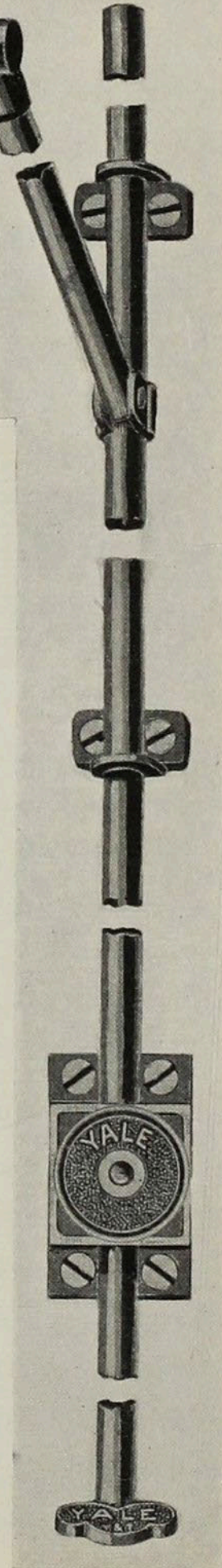


Fig. 7.

pivots are needed which are termed "sash-centres." The usual form of these is shown by Fig. 8, but a better form is shown by Fig. 9, which is termed a Rabbeted centre, its construction giving greater strength, and completely closing the joint against light. They are of bronze, and of various sizes.

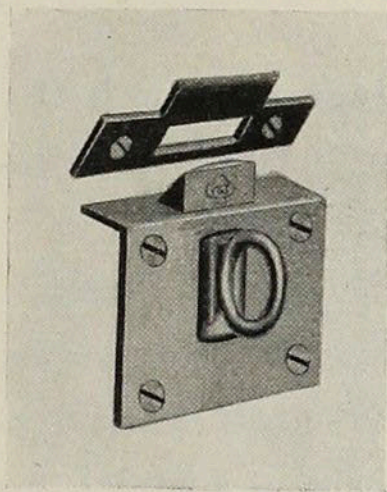


Fig. 10.

TRANSOM CATCHES (Fig. 10).—These are spring catches, or bolts, of various forms, but all having a ring or eye in the handle from which a cord may be suspended or into which a "pull-down hook" (see page 183) may be inserted to operate the sash.

TRANSOM CHAINS (Fig. 11).—These are not needed where a Transom Lift is used, being merely a short length of chain, with

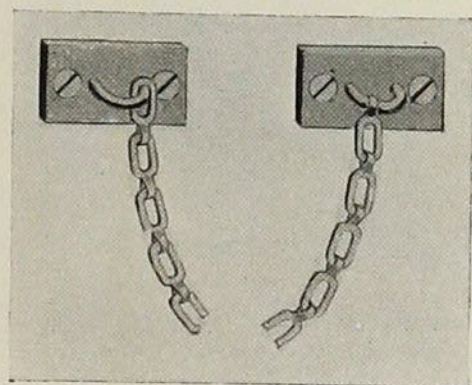


Fig. 11.

an attaching eye or plate at each end, applied so as to limit the opening or swing of a transom light when hinged at the bottom.

FAN-LIGHT FIXTURES.—A transom light with semi-circular top, termed a fan-light, may be hinged at the bottom or pivoted on its vertical axis. In either case it is somewhat troublesome to operate, and requires special fixtures, information concerning which can best be obtained by applying to the manufacturer and furnishing the latter with a sketch or description of the fan-light and its surrounding trim.

## Section 22.

### Minor Fastenings.

**I**N addition to the more important fastenings such as Locks, Bolts, etc., previously described, many others are made for special purposes, among which are the following :

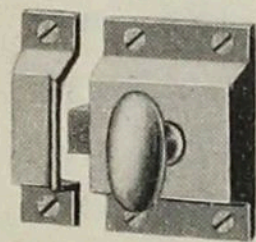


Fig. 1.

**CUPBOARD TURN** (Fig. 1).—This is a spring bolt or catch operated by a rotating knob. It is made in a great variety of sizes, styles and qualities, and is adapted to a wide range of uses.

#### CUPBOARD CATCH

(Fig. 2).—This is intended for the same uses as the preceding, but is operated by a slide knob instead of by one which turns. It is made in both the Rim and Flush varieties, the latter being shown by Fig. 2.

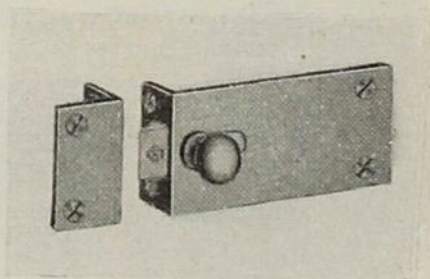


Fig. 2.

**CUPBOARD BUTTON** (Fig. 3).—This old device is now little used except in work of the cheapest character.



Fig. 3.

**TURN BUTTON** (Fig. 4).—This is a Cupboard Button mounted on a plate. When properly made it is a convenient and substantial device, available for any hinged door or sash.



Fig. 4.

#### LAVATORY LATCH

(Fig. 5).—This device is intended for use on lavatory doors, but is also available for other purposes.

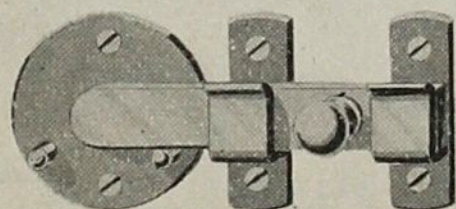


Fig. 5.

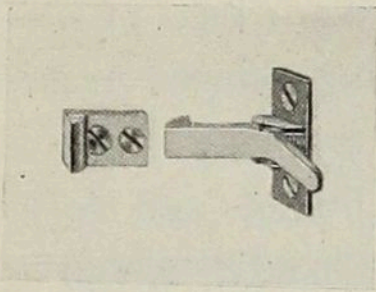


Fig. 6.

ELBOW CATCH (Fig. 6).—This is a convenient fastening for the standing part of the double doors of pantry closets and the like.

BOOKCASE BOLT (Fig. 7).—This is an automatic device, mortised into the soffit of a bookcase or other cabinet, in such position as to engage with the top edge of one door of a pair, and operated by the act of closing the other door which carries the lock, so that both doors are fastened (or released) by a single action.

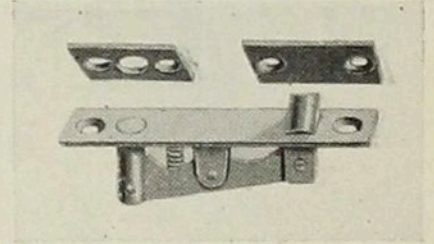


Fig. 7.

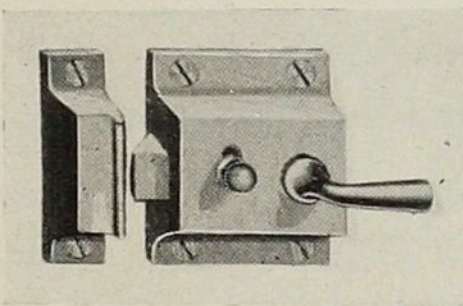


Fig. 8.

SCREEN DOOR CATCH (Fig. 8).—This is a Rim Knob Latch, with spindle passing through the door which carries a small knob on its outer end and a knob or bent handle on its inner end. It also has a stop whereby the latch may be dogged from the inside.

MORTISE DOOR BOLT (Fig. 9).—This is a tubular bolt operated by a rotating knob, and appropriate for bedroom doors.

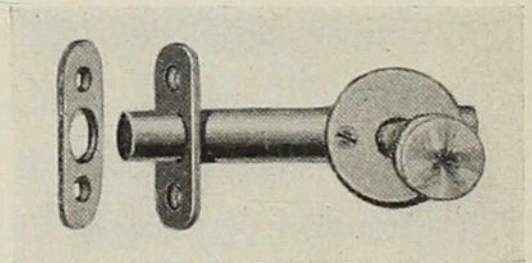


Fig. 9.

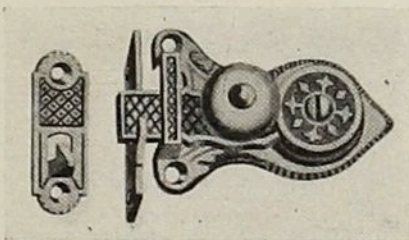


Fig. 10.

CUPBOARD LATCH (Fig. 10).—This is a convenient fastening for cupboard doors, consisting of a pivoted latch, actuated by a projecting knob. As shown by the illustration it is furnished with two forms of strikes, one for application on the edge and the other on the surface of the jamb or door.

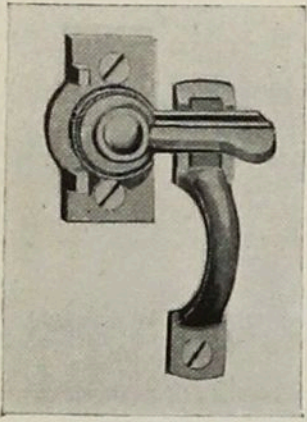


Fig. 11.

CELLAR WINDOW FASTENER (Fig. 11).— This device is for fastening hinged sashes opening inward. The swinging bar is attached to the window frame, and locks over the upper end of a handle which is attached to the sash for use in opening the latter.

LEVER CUPBOARD CATCH (Fig. 12).—

This is a very simple and convenient fastening. It consists of a bar pivoted to a plate and extending inward through the door, its inner end being hooked to engage with a strike, (attached to either side of a shelf), and its outer end terminating in a knob by which the lever may be moved and the door opened.

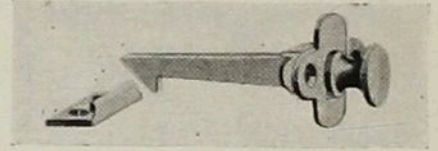


Fig. 12.



## Section 23.

### Double-acting Hinges.

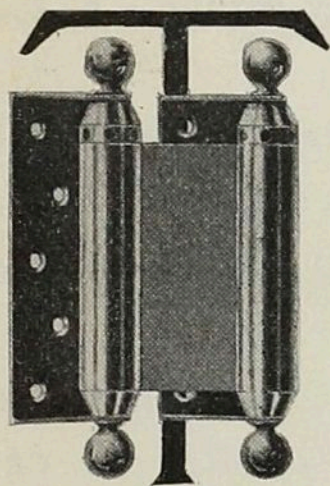


Fig. 1.

THE purpose of these is to permit a door to swing in both directions by combining two hinges in one structure. This implies a much heavier and more costly construction than a single-acting hinge, so that the use of the double-acting hinge is usually limited to the corridor doors of hotels and public buildings, although it is sometimes used on pantry and kitchen doors in private residences.

For these uses, however, it is usually desired that the doors, while free to swing either way, shall be self-closing, and therefore the device commonly used is the double-acting spring hinge (or butt), the character of which is shown by Fig. 1.

In this one or more heavy springs are combined with a double-acting butt in a manner such that, when the door is opened in either direction, the force of the springs tends to close it and to hold it at the neutral or centre position. As no fixed stop can be provided for such a door to close against, it usually swings past the neutral point until the power of the spring is exhausted, and then swings too far again in the other direction, continuing this oscillation until it gradually comes to rest at the neutral point. This repeated oscillation of the door every time it is used is apt to cause an unpleasant noise, is sometimes dangerous to persons passing through it, and, above all, involves unavoidable strain and wear of the double-acting spring butts, so that the latter often need readjustment or repairs.

Notwithstanding all these objections the device has served a useful purpose, has been extensively used and is still the most

available one in certain places, especially for *single* doors which are required to swing both ways. Among the double-acting Spring-hinges which are most favorably known are the "American," "Gem" and "Oxford," made by the Columbian Hardware Co., the "Bommer" and that made by the Chicago Spring Butt Co.

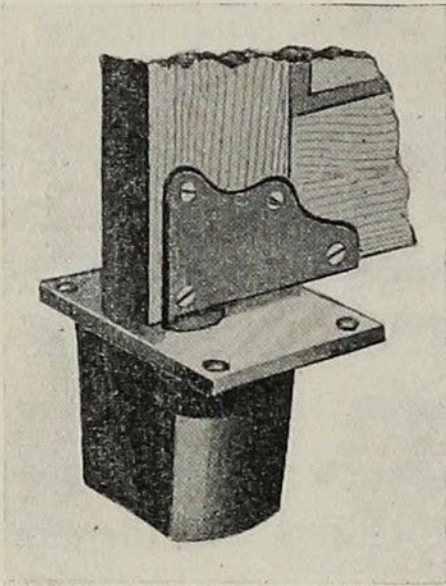


Fig. 2.

For *double* doors, however, a much better arrangement has become available recently, viz.: the Duplex Stop and Blount Checks, which are fully described in Sec. 24, and which, at equal or less cost, accomplish the desired purpose in a better manner, and with greatly reduced liability to accidents and need of repairs.

Another device for the same purpose is the double-acting Floor Hinge, made by Bardsley, Bommer Bros. and others, the general character of which is shown by Fig. 2. The door in this case swings on a pivot instead of a hinge, and this involves a modification of the door and its frame, which must be provided for in the original plans.

An unavoidable, and sometimes very objectionable, defect in *all* double-acting hinges is that they preclude the use of any stop for the door to close against. Hence, the door never closes by "first intention" (to use a surgical phrase), but only after repeated oscillations in each direction, and, still worse, is held very insecurely in the closed position, so that it yields easily to wind pressure and thus is ineffective against drafts. All of these difficulties are overcome by the more modern and better device: the Liquid Door Check, described in Sec. 24.

## Section 24.

### Door Springs, Checks and Stops.

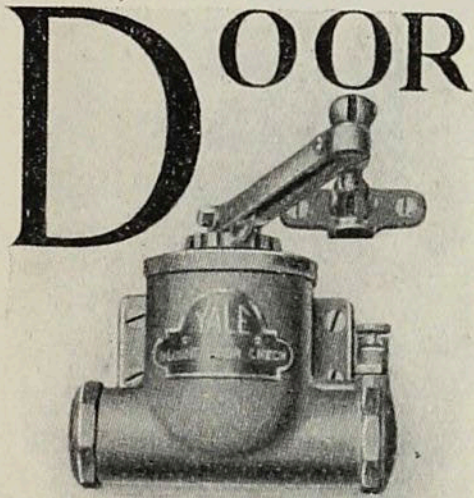


Fig. 1

**D** OOR SPRINGS are made in a great variety of styles and grades, from the simple torsion-rod known to an earlier generation by the name of Torrey and still in use, to elaborate coil springs with heavy mountings and of excellent quality. As they are seldom included in Architects' specifications they will not be described in detail here. If needed they should be selected by the inspection of samples rather than from catalogue.

The door spring has for many years been in universal use in America, but public sentiment was long undecided whether it should be regarded as an unqualified convenience, an unmitigated nuisance or a necessary evil. This state of doubt was ended, some fifteen or more years ago, by the invention and introduction of the Door Check, a device intended to curb the "pernicious activity" of the door spring by compelling it to behave decently and to perform its useful function without "getting on the nerves" of everyone within hearing. Unfortunately, however, escape from one difficulty led into the jaws of another. All the earlier door checks, of which the Norton was the best and most widely known, were of the pneumatic type, that is they depended on the use of *air* as a cushion to resist the force of the spring. In effect each was a reversed air-pump. Now the only effective and simple packing which has been found for the piston

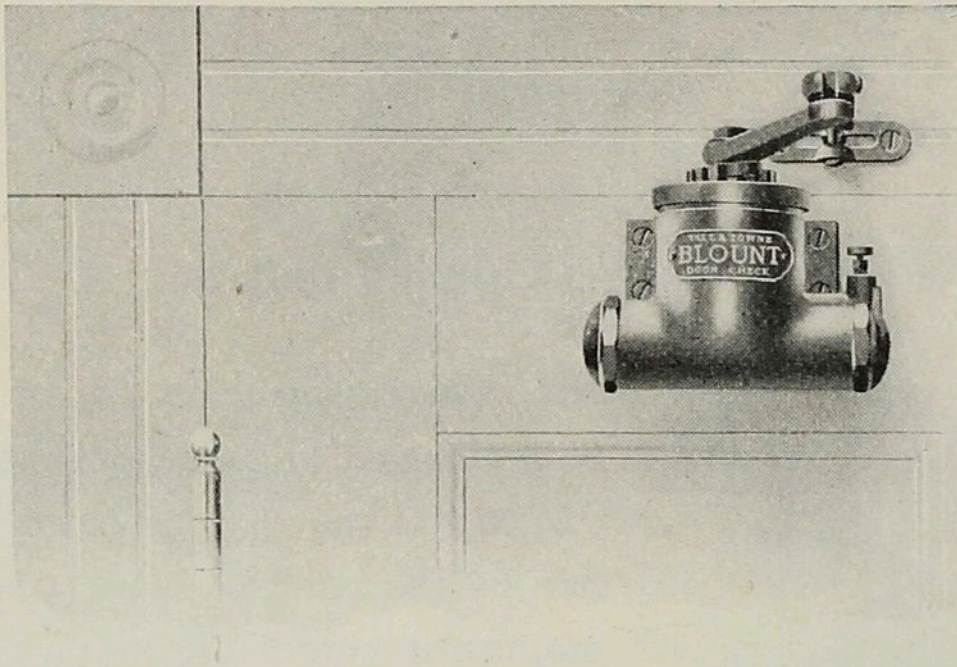


Fig. 2. Right-hand Door from Inside. Use Right-hand Check.

of an air-pump is a cup made of leather which has previously been thoroughly soaked in oil. So long as this remains soft and pliable it makes an excellent packing, but when it becomes dry and hard it becomes useless as such, and experience has long since shown that, as used in pneumatic door checks, such packings deteriorate rapidly, and ultimately give out entirely. This is due not only to the drying out and oxidizing of the oil, but also to the glazing and wear of the leather from its constant rubbing against the cylinder. The change which thus occurs is continuous from the time the check is put into use, necessitates frequent readjustment of the regulating valve, and ends in permitting the door to slam unchecked, thus reverting to the "original sin" which the device was desired to eradicate.

The combination of a Door Spring and Check, however, produced a result too satisfactory and too useful to be lost, and a recent invention averts this danger by furnishing a device which meets all the requirements of the case. This is the Yale-Blount Combined Door Spring and Check, first introduced about 1895, the latest model of which is shown by Figs. 1 to 3. This check is of the hydraulic type, the resistance to the piston being

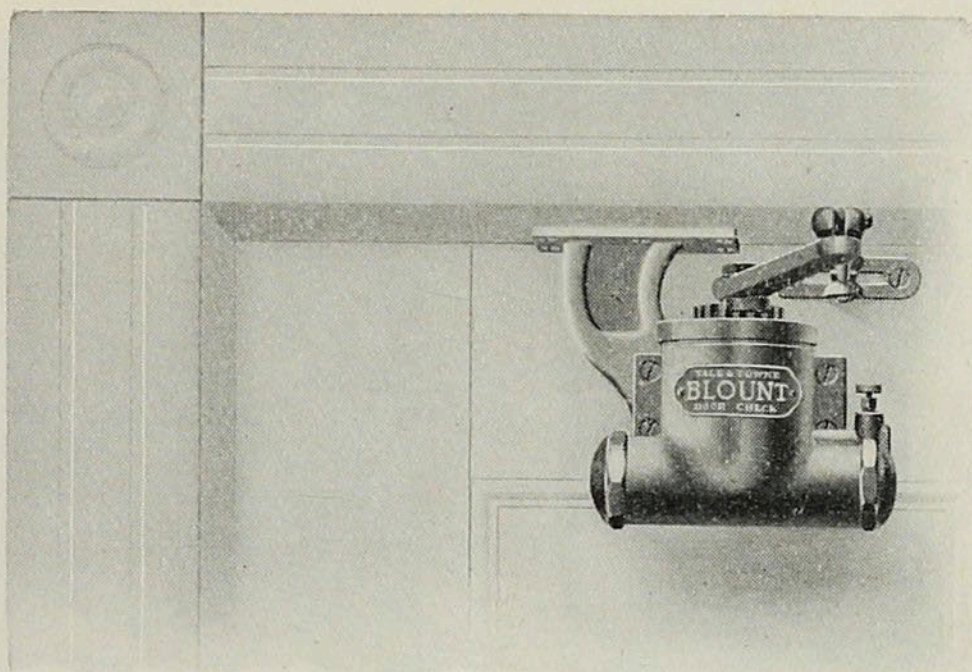


Fig. 3. Left-hand Door from Outside. Use Right-hand Check.

a non-freezing *liquid* instead of *air*. By this substitution of a suitable for an unsuitable checking medium all difficulties were overcome, and an absolutely satisfactory and permanent device obtained.

Full information concerning the Yale-Blount Door Check, as the device is usually termed (although it includes a spring), is given in Part VI, but it may here briefly be explained that the check consists of a metallic piston, without packing, moving in a tightly sealed metallic cylinder containing a lubricating and non-freezing liquid, the movement of the door depending on the escape of this liquid, around the piston, from one end of the cylinder to the other, this being controlled by a valve which can readily be adjusted to produce any desired action of the door. Once properly applied and adjusted it will continue to function permanently, without appreciable change or wear. It closes the door silently, with a smooth, steady motion and without the rebound so noticeable in an air check.

Another good check of the liquid type is the Corbin, which embodies the same general principle as the Yale-Blount, but does not include all of the improved details of the latter.

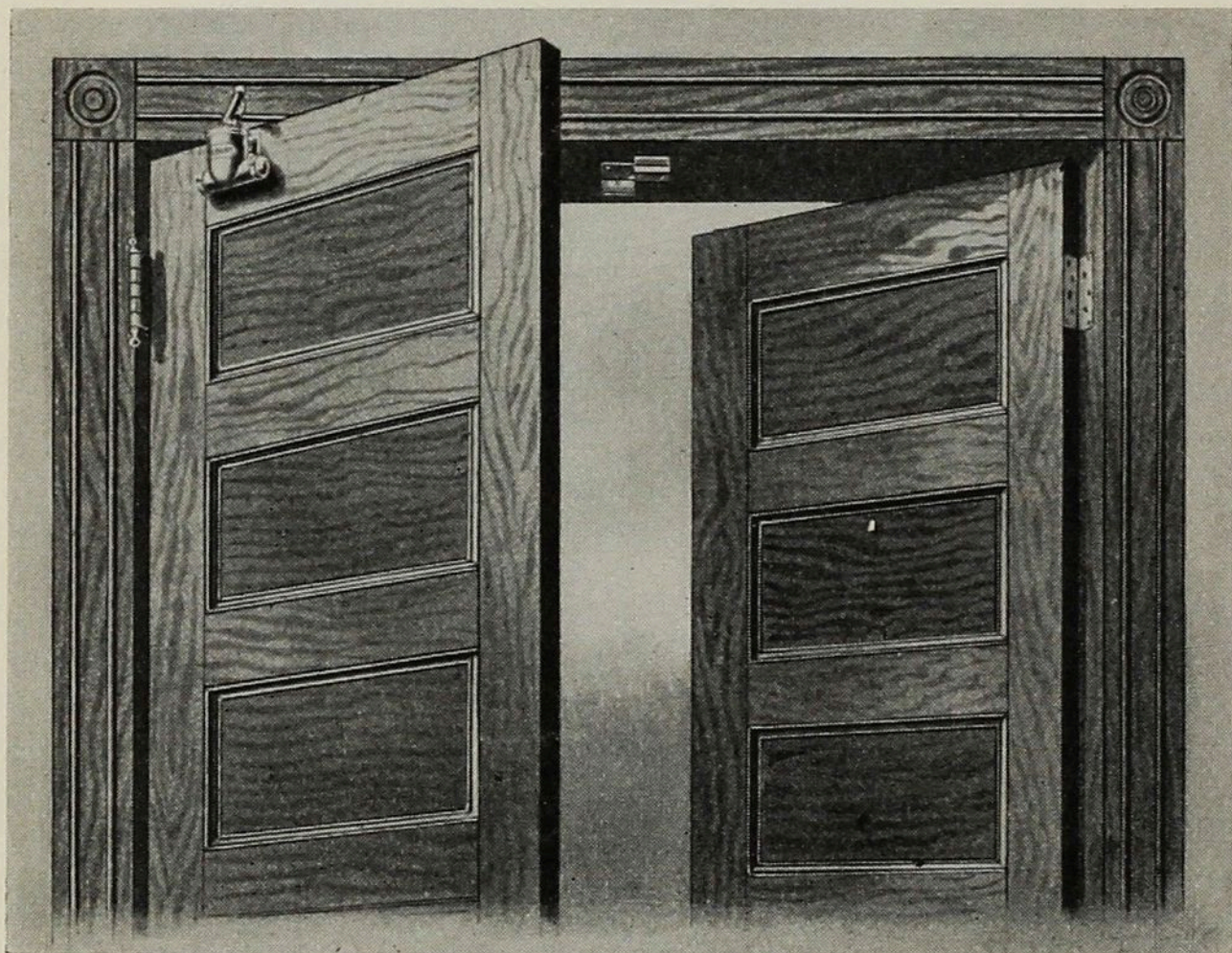


Fig. 4. The Yale-Blount Check and Duplex Stop.

The Yale-Blount Door Check, combined with the Duplex Stop (see Fig. 4) affords the best method of mounting double doors which are required to swing both ways, and is an ideal substitute for the objectionable double-acting spring hinge. It eliminates the danger and unpleasant "flip-flap" of the latter, and, by dividing the tide of travel into two streams, each always moving in the same direction, greatly facilitates movement in crowded passages.

The general employment of door checks, wherever a door spring is needed or desirable, has been greatly retarded heretofore by the faults and failures of the *pneumatic* check. This difficulty is now overcome by the Yale-Blount *liquid* Check, and as the reliability of this becomes better known the use of door checks, already very extensive, is sure to increase largely and permanently. Already it is becoming usual to apply them to all corridor doors of large office buildings, and even to room doors in hotels, while

they are everywhere in evidence on entrance doors of all kinds, and on pantry, water-closet and other doors of frequent use which it is desired shall not stand open. For this reason it is increasingly customary to include door checks in the original equipment of a new building, rather than to leave them for subsequent application. This implies their inclusion in the hardware specification or contract, in which case it is important that checks of the proper kind, size and finish should be specified. Information on these points is given in Part VI.

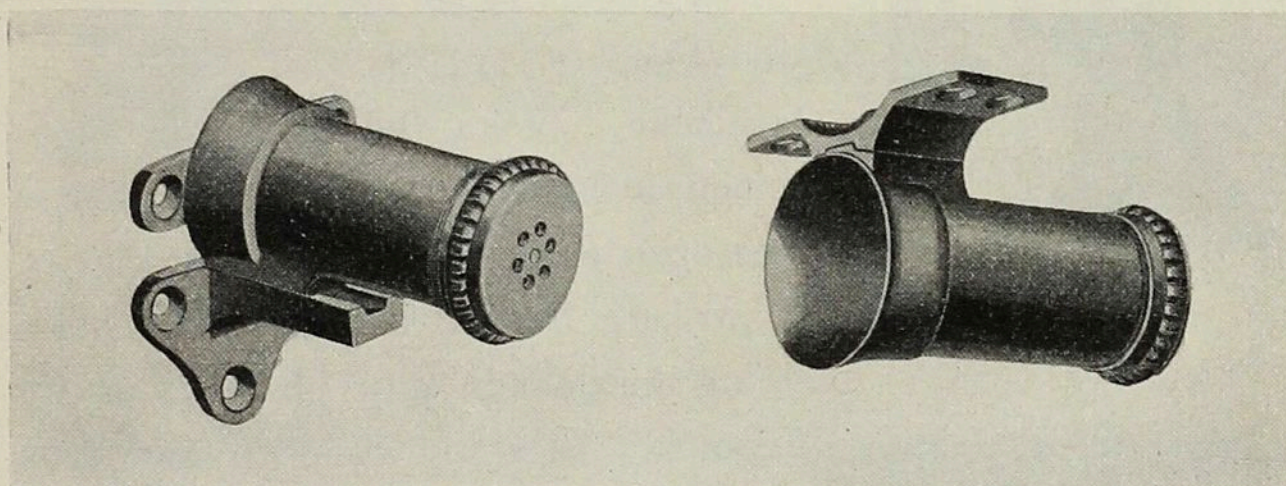


Fig. 5. The Pneumatic, or Air, Check.

For some minor uses the air Check is still in use, and one of the latter, made by Sargent & Co., is shown by Fig. 5. This is a buffer, or air cushion, against which the door impinges when closed by a spring, and which tends to cause the door to close without slamming. It possesses the defects common to *all* air checks, how-

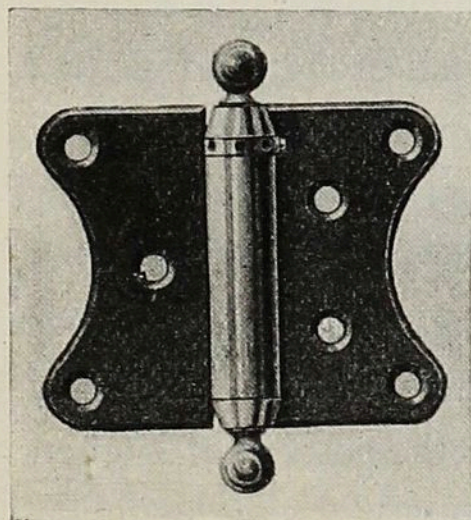


Fig. 6.

ever, and, at the small difference in cost which exists, the *liquid* check is always preferable and, in the end, cheaper. —

For some uses, notably for screen doors and the doors of hotel water-closets, (usually to hold the latter *open*), a simple Spring-hinge is used, an example of which is shown by Fig. 6.

A Door Stop is a device for limiting

the backward swing of a door, and it may also have the additional function of holding the door in an open position, in which case it is designated as a Door Holder. The ordinary door stop is

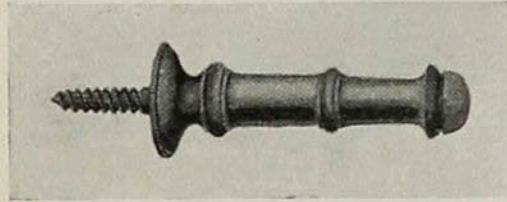


Fig. 7.

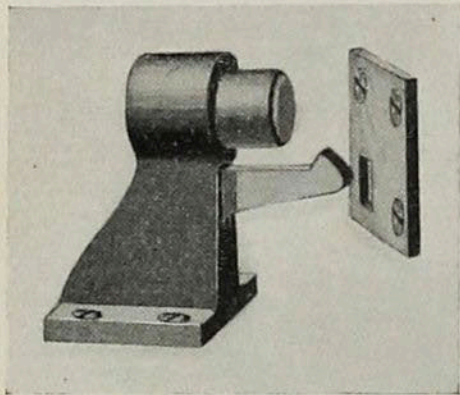


Fig. 9.

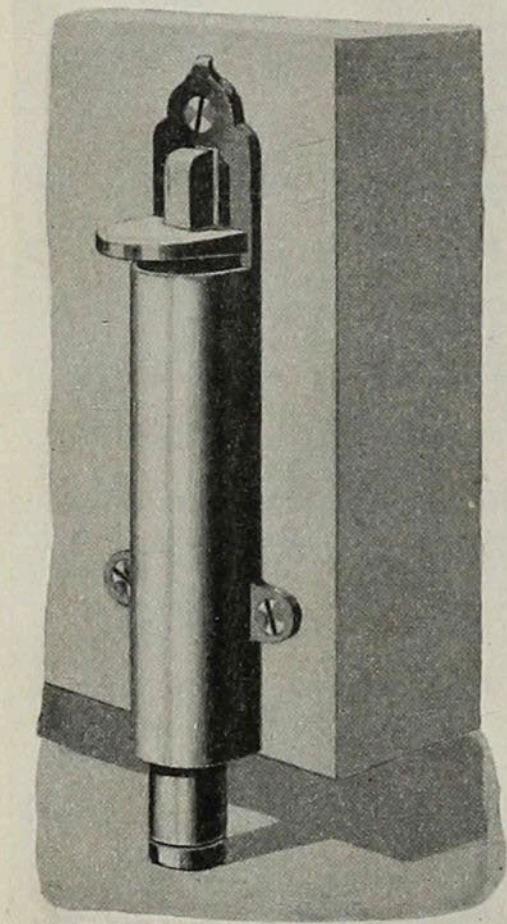


Fig. 10.

simply a Knob, usually of wood and with a rubber tip or ring, for insertion in the wainscot or floor, but better grades, made of metal and of various forms, as shown

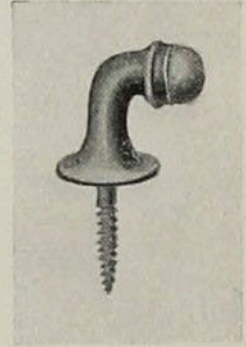


Fig. 8.

by Figs. 7 and 8, are available. With these may be combined a hook for fastening the door in the open position, as shown by Fig. 9.

Where facility is desired for holding the door in any position, or for quickly fastening it open and soon releasing it again, as in case of a pantry door operated by a Yale-Blount Check, a Door Holder, as shown by Fig. 10, should be availed of, the action of which is conveniently controlled by the foot. In this connection it may be mentioned that serving-windows, between kitchen and pantry, will be found very convenient and effective, if closed by a *hinged* sash, controlled by a Blount Check of small size, which will automatically, but quietly, close the sash after each use, thus preventing the passage of kitchen odors and noises.



## Section 25.

### Hinge, Corner and Kick Plates.

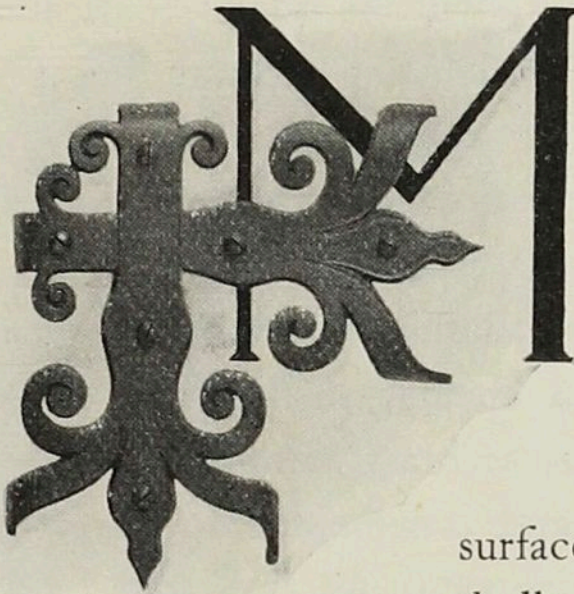


Fig. 1.

MEDIAEVAL hardware was the product of the blacksmith and the whitesmith, the former working with forge and hammer, and the latter with chisel and file, the material being wrought iron. The butt-hinge was unknown, and the strap or surface hinge in universal use, and as this was wholly in sight it became naturally the subject of decoration, chiefly in outline, but occasionally also by surface ornament. Hence followed the practice of making the hinges, especially of large entrance doors, a prominent feature of ornament, and of supplementing them with similar plates of metal at the corners of the door, which served the double purpose of strengthening the door and of adding to its decoration.

With the adoption of the butt-hinge (that is, one applied to the edge or "butt" of the door) for general use the opportunity for utilizing the hinge to decorate the surface of the door disappeared, but with the modern revival of decorative art the desirability was quickly perceived of restoring the use of constructive metal-work as a feature of surface decoration for important doors. This is accomplished by combining with the modern butt (which carries the door) a surface *plate* which simulates the strap-hinge.

Obviously the width of the butt of a hinge-plate should correspond with the height of the butt-hinge with which it is to be

used, and both should be of the same metal or finish. Its other dimensions are governed by the size of the door and by taste, as is true also in the case of corner plates. The variety of designs and sizes now available is such that special patterns are rarely necessary. In Part VII, Section 2, will be found illustrations of a few hinge and corner plates which will indicate the possibilities their use affords.

A more modern device is the "kick plate," applied to the bottom rails of much used doors, especially when hung on double-acting hinges, as in public buildings, to receive the wear incident to the use of the foot in opening such doors. These are frequently made of sheet bronze or brass, but are much handsomer when made of cast metal and ornamented to harmonize with the other metal work of the door. As indicated by the illustration below, and others in Part VII, Section 2, the latter treatment admits of very effective and even elaborate development, extending occasionally over nearly the entire surface of the door.

In ordering door plates of all kinds the architect should consult the manufacturer and avail of existing patterns so far as possible, unless prepared to incur the expense which special designs and patterns entail.

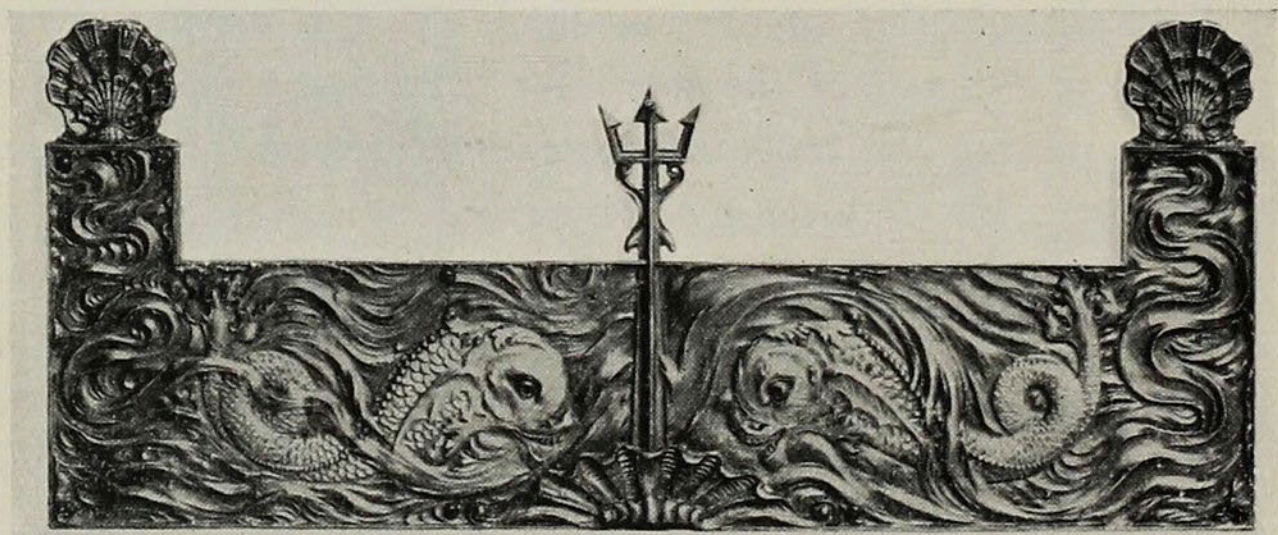
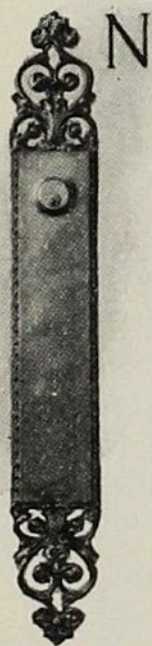


Fig. 2

## Section 26.

### Trim for Special Conditions.



ADDITION to the standard articles described in the preceding sections of this part a great number of devices of special construction and of different sizes are made, a selection from which will usually meet almost any conditions likely to arise.

To utilize these, however, it is important that a knowledge of them should be obtained before the details of woodwork are made, in order that, if possible, the latter may be conformed to the conditions for which the hardware is intended, thus avoiding the necessity for special hardware and the increased cost which this would entail.

To this end the Architect or draughtsman, when making detailed drawings of woodwork which obviously involves the use of hardware of special character, should inform himself *at the time* concerning the hardware which may be available, and if possible should harmonize the details of the woodwork thereto.

This information can best be obtained, either through a dealer or by direct correspondence, from one of the larger manufacturers of Builders' Hardware, each of whom has a great variety of special devices additional to those shown in their catalogues, and who, if advised of the problem to be solved, can usually suggest methods which will give the desired results by utilizing existing devices without resorting to the expensive process of designing and making special hardware.

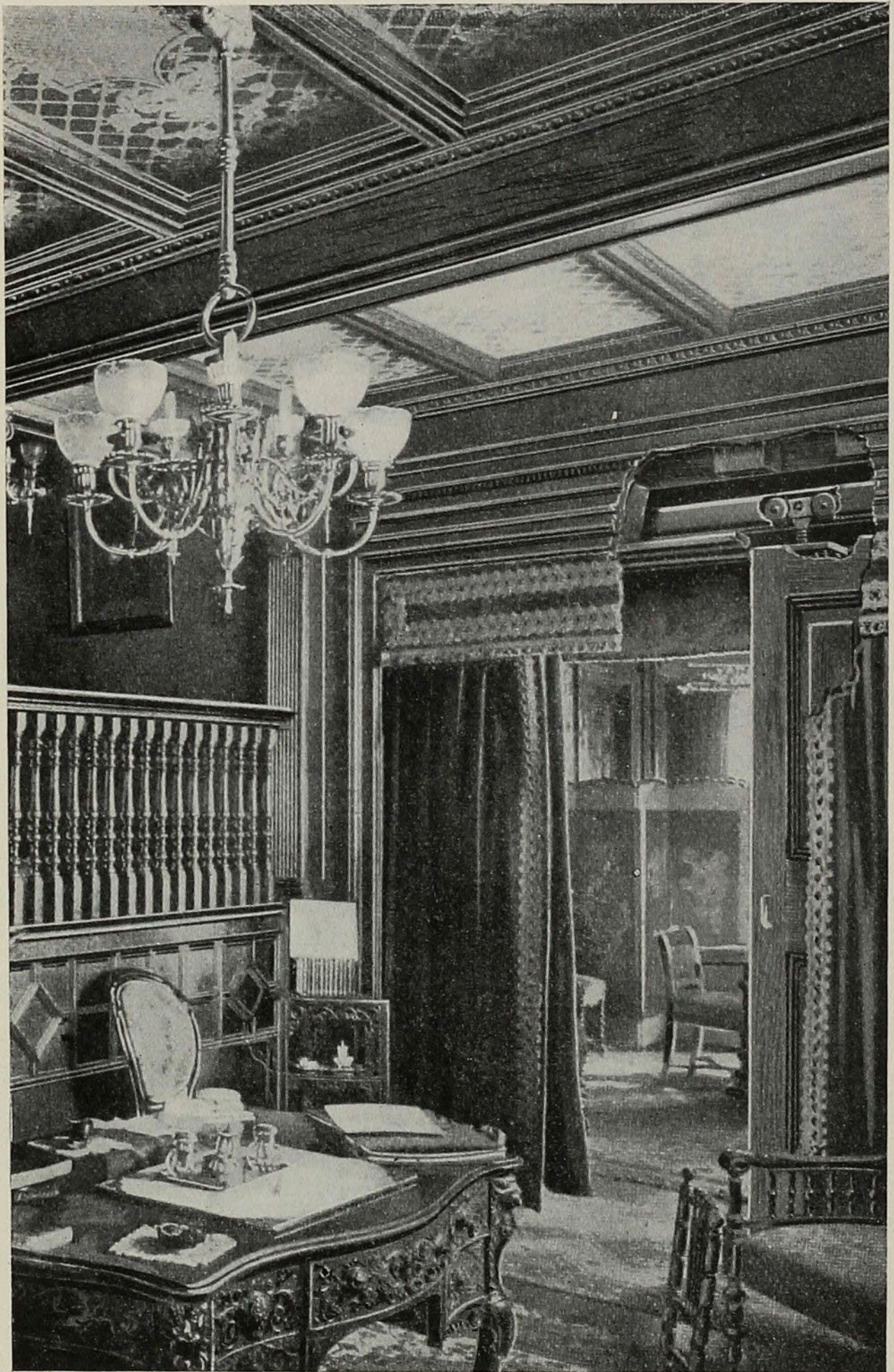


Fig. 1. Woodwork broken away to show Sliding Door Hanger in position.

## Section 27.

### Sliding Door Hangers.

**F**ORMERLY sliding doors were carried on shieves or rollers, located at bottom of door and traveling on a metal track inserted in the floor, but this system has been almost universally displaced by the more modern one in which the sliding door is suspended by hangers, at the top, which carry wheels running on an overhead track contained in a recess formed for the purpose above the soffit of the doorway: see Figs. 1 to 4.

The use of the overhead hanger implies a special construction of the door jamb, to provide space for the overhead track and a proper support for its brackets. Therefore it becomes necessary to determine *in advance* the type of hanger to be used, and to conform the framing and other details of the door-way thereto. For these and other reasons sliding door hangers are usually

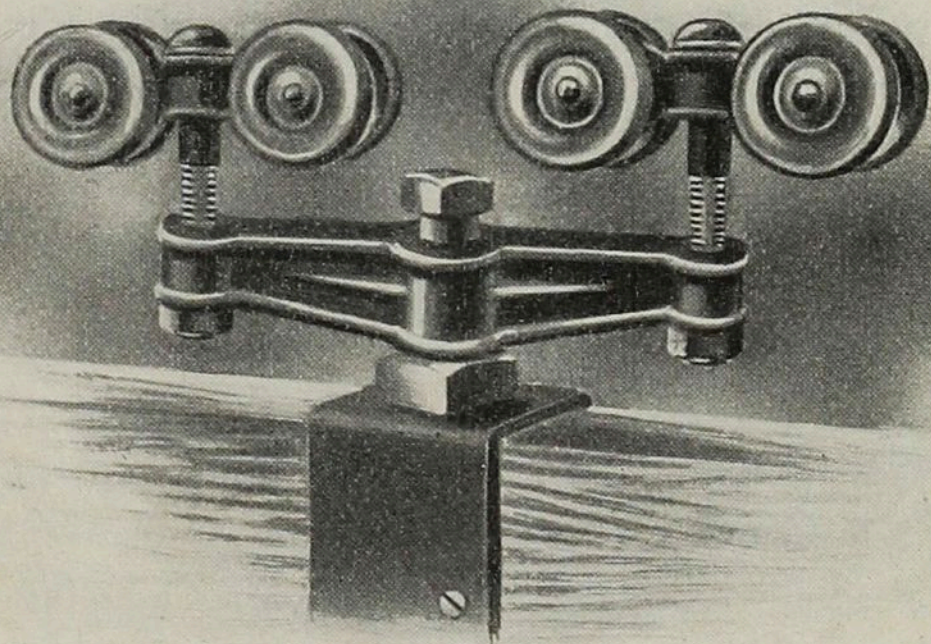


Fig. 2.

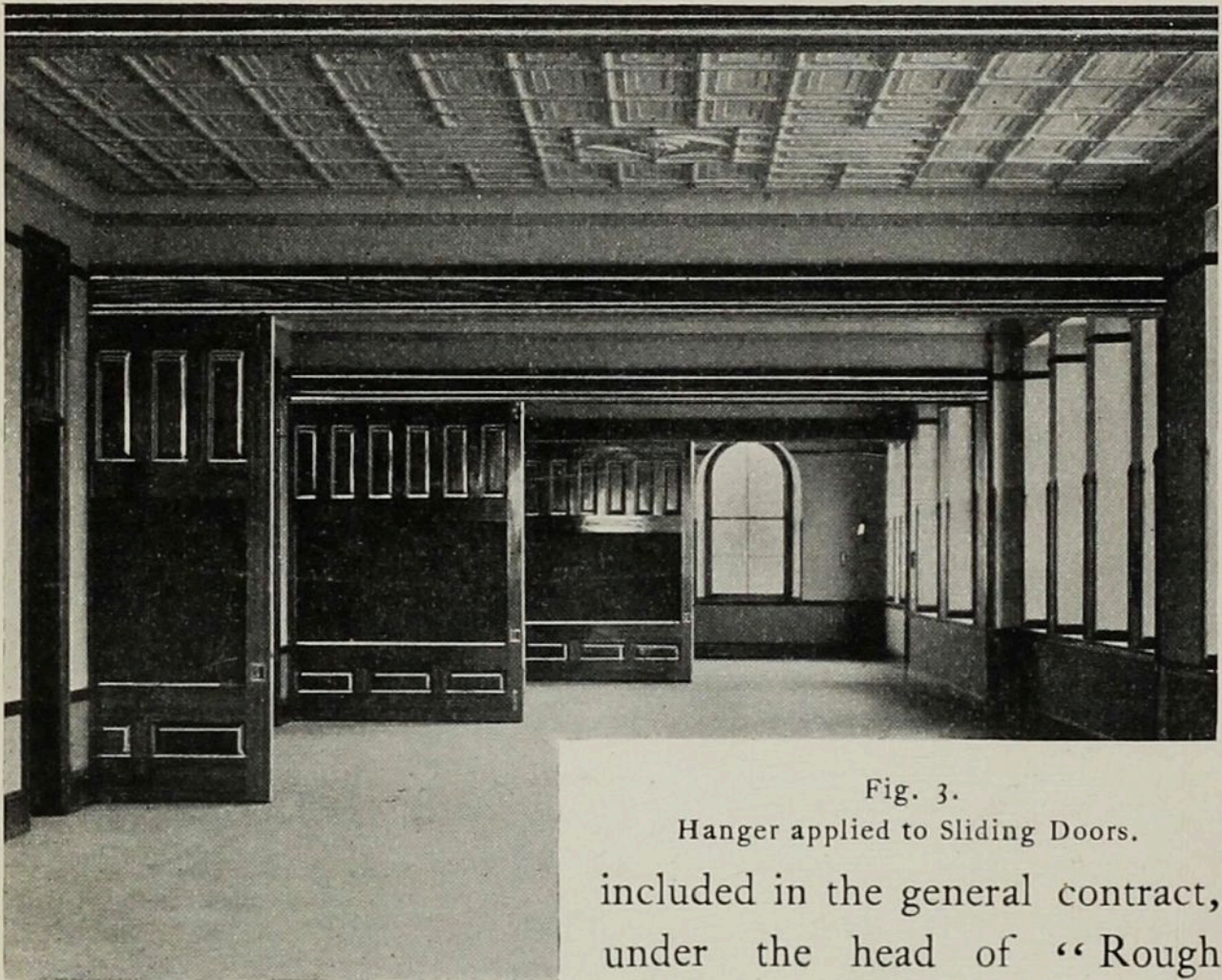


Fig. 3.

Hanger applied to Sliding Doors.

included in the general contract, under the head of "Rough Hardware," and do not properly belong under the head of "Finishing Hardware."

In the case of any hanger, the most important features to be considered are the strength and stiffness of the track; the provision for adjusting it when necessary; the provisions for reducing friction and noise; and, finally, the strength and quality of the several parts, and the facility with which they can be fitted in place and adjusted when in use.

In all first class hangers the track is made of steel, but in some cases this carries a hard wood surface on which the rollers run, while in others they rest directly on the metal. Noiselessness is sought by the use of a wooden track surface (as mentioned above), by means of fibre wheels, and by the use of ball bearings, these latter serving also to diminish friction. The practice of the different makers varies in these respects, and most of them make hangers of several grades.

Among the sliding door hangers which are most favorably known may be mentioned the McCabe, the LeRoy and the Coburn.

The various manufacturers have intelligently studied the modern conditions and requirements of sliding and folding doors of every kind, and detailed information will be found in their catalogues concerning all of the various types and grades of hangers. The best results will usually be obtained by consulting these, and, after selecting the type of hanger preferred, by stipulating in the contract that the maker, or his agent, shall be responsible for its satisfactory operation, subject, of course, to its proper installation by the contractor or builder.

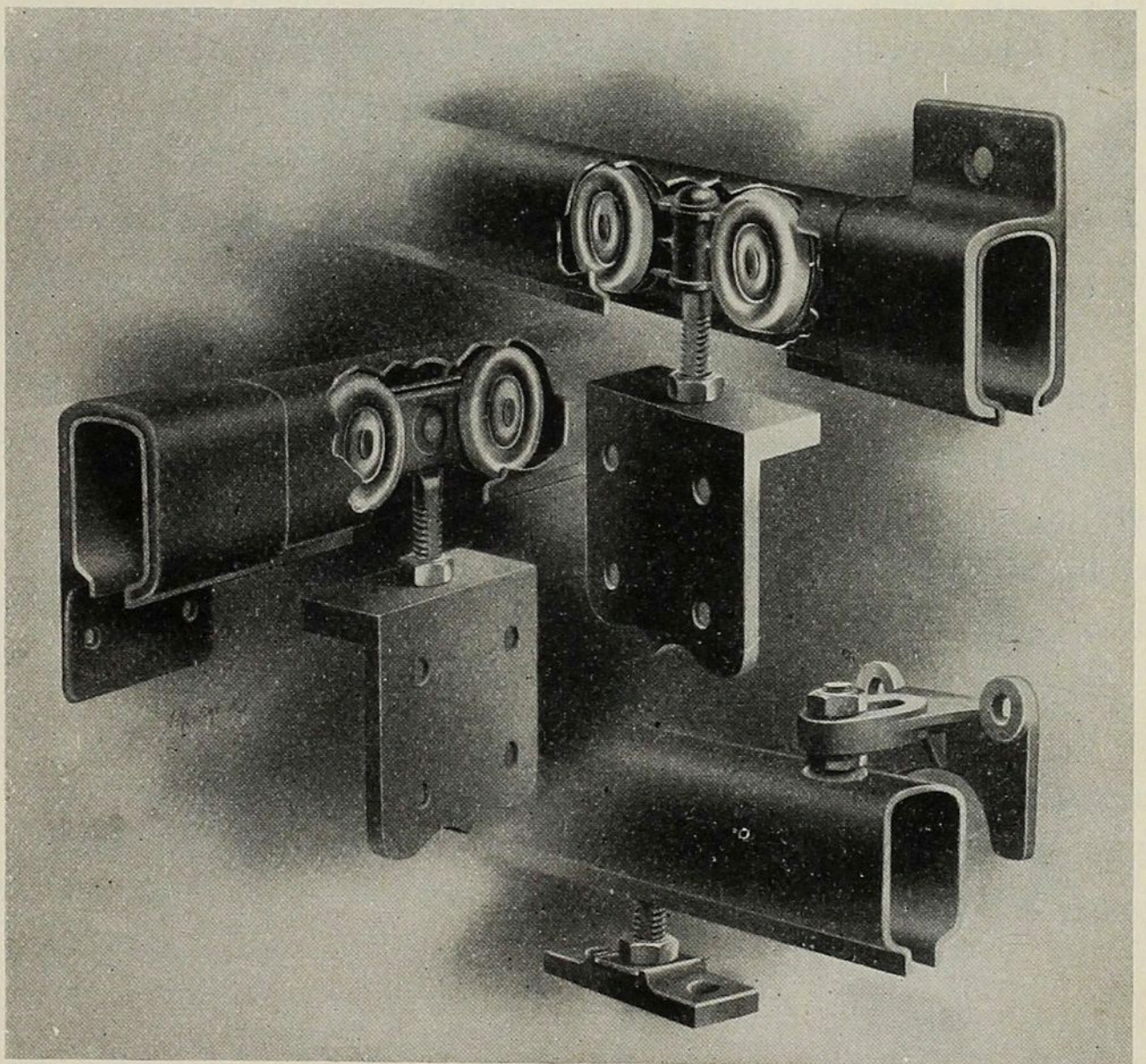


Fig. 4. Steel Hangers and Tracks.

## Section 28.

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### Pivoted Window Trim.

THE problem of mounting large, single light sashes so that they may be opened by rotating on a vertical axis, and yet when closed be weather tight, is one involving numerous and rather serious difficulties.

The best device thus far available for this purpose is Giesey's Elevating Window Pivot, which pivots the sash vertically and, by means of a lever (which lies horizontally against the bottom rail of sash when at rest), can be operated to lift the entire sash until its bottom is clear of the lower stop-bead and the sash is thus free to swing over the latter. A false head, or follower, rests on the upper rail of the sash, which, when the latter rises, enters into a pocket or recess in the head of the window frame, the top rail of the sash when raised thus clearing the under side of the head of window frame.

The device is of simple but substantial construction, and thoroughly accomplishes its purpose. It is made in all sizes and finishes, and holds the window when open at any desired angle. No other hardware is necessary for a window where the Giesey Pivot is used.

As a special construction of the window frame is necessary for this device, full information concerning it should be obtained *in advance* and be embodied in drawings and specifications. The necessary information can be obtained from the manufacturers, Steiner & Voegtly, Pittsburgh, Pa.



## Section 29.

### Padlocks.

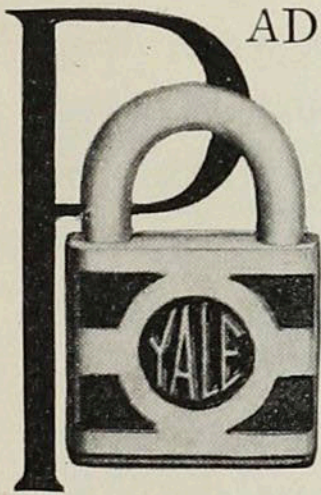


Fig. 1.  
Cast Bronze, No. 851.

**P**ADLOCKS are not included in the term “Builders’ Hardware” and therefore will not be described herein. Occasionally they are required in connection with Architects’ work, and in such cases should be selected carefully by sample.

Padlocks are made in a vast variety of sizes, styles and qualities, retailing at prices ranging from \$5.00 each down to ten cents or less. For use where exposed to moisture or the weather they should be of bronze; where exposed to violence they should be heavy, and preferably should have steel shackles; where used in series a type should be selected which has numerous tumblers and key-changes; where wanted under control of a master-key a type should be chosen which admits of master-keying without undue impairment of security. A selection should always be based on an inspection of actual samples, not on catalogue representations.

The illustrations herewith represent two of the best known high grade Padlocks (one of which can be master-keyed when desired), selected from the extensive line made by the Yale & Towne Manufacturing Company.

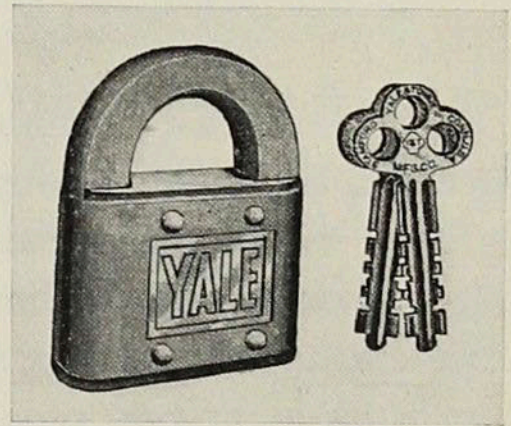
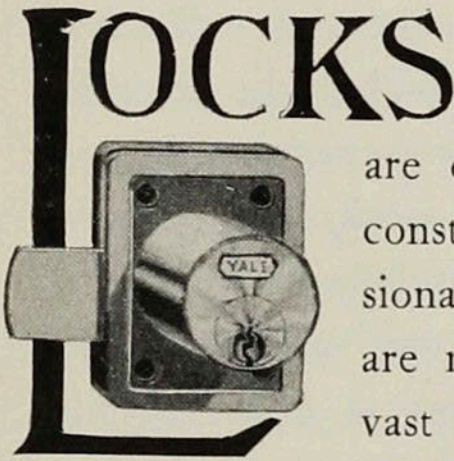


Fig. 2.  
Wrought Steel, No. 8454.

## Section 30.

### Cabinet Locks.



Yale Paracentric  
Cabinet Lock.

**LOCKS** FOR furniture and cabinet work, designated generically as “Cabinet Locks,” are quite distinct from Builders’ Locks, and constitute a separate industry, but enter occasionally into the work of the Architect. They are made chiefly of wrought metal, and in a vast variety of kinds, sizes and grades, and owing to this diversity much care should be exercised in their selection where good quality is sought.

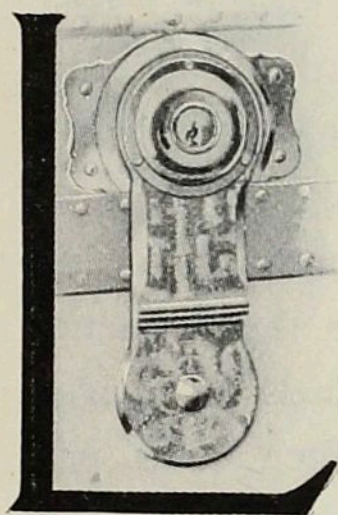
The leading kinds are Drawer (or “Till”) locks, Wardrobe locks, Chest and Box locks, and Desk locks, but there are many others for special uses, and the catalogue of a manufacturer should be consulted for full information. A complete line is made by the Yale & Towne Manufacturing Company, and selections from this, covering the locks most commonly required in connection with the work of Architects, are described in Part IV.

The Yale Lock (pin-tumbler type) is to be preferred for the best work, and wherever high security is desired, while for other uses other types are available, both with flat and with round keys. Many of them admit of being *master-keyed*, for use on lockers in club-rooms, armories, etc. For Desk Lids the Pasquil lock is the best type.

An extensive line of Cabinet Hardware is described in Part VIII, and some such Hardware is included in many of the lines of ornamentations illustrated in Part III, Section 3, under the various Schools of Ornament.

## Section 31.

### Trunk Locks.



Yale Paracentric  
Trunk Lock.

LOCKS for trunks, suit cases and bags constitute a wholly distinct class, and one in which the architect has no interest, except as an individual user, for which reason they will not be described in this volume. Their manufacture is usually combined with that of cabinet locks, with which they have much in common, and a complete line is made by the Yale & Towne Manufacturing Company in its cabinet and

trunk lock department.

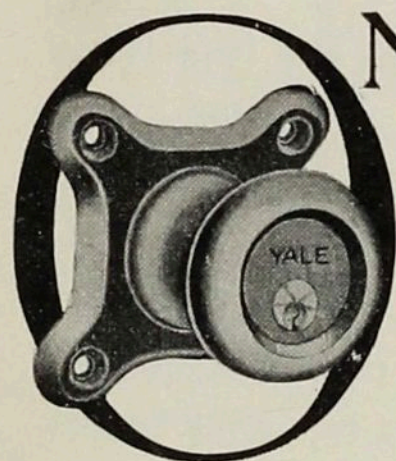
These locks are made in a great variety of kinds, sizes and grades, from an expensive lock of the Yale, pin-tumbler, type, to the simplest and cheapest kinds. Naturally the latter are chiefly used by trunk-makers, and purchasers who desire locks of the finer grades must expect to pay accordingly and must exercise care in selection.

The illustration above shows the Yale & Towne No. TB600 Trunk Lock. This is of the "Yale" type with Paracentric keys, is of heavy cast bronze and of higher grade than any of the trunk locks commonly used. Where wanted it can be obtained from trunk makers, and should be specified by the above number.

## Section 32.

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### Asylum Locks.

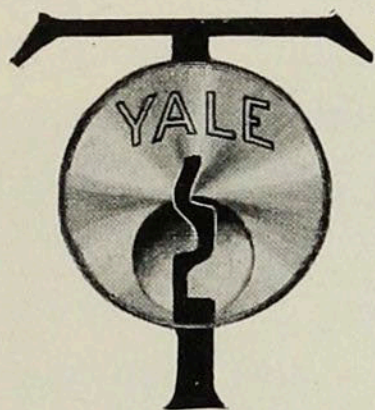


**N** THE doors of Hospitals for the Insane, of Reform Schools, and other Public Institutions, locks of special character should be used, designed and adapted to meet the peculiar conditions of the service, especially where their function is rather to lock individuals *in* than to keep intruders *out*. Such locks, particularly for Insane Asylums, are exceptionally exposed to attempts at tampering, and accordingly should be especially constructed to meet these conditions.

Convenience in service commonly demands the use of spring latch-bolts, and this in turn involves special methods of construction to protect such bolts from attack, through the crack of the door or otherwise. This is accomplished by the use of guarded fronts, box strikes and other precautions. An extensive line of locks for these uses, including provision for control by master-keys, is made by the Yale & Towne Manufacturing Company, full particulars concerning which can be obtained on application, and such information should always be sought *in advance* when preparing plans and specifications.

## Section 33.

### Prison Locks.



THE locks required for the cell and corridor doors of prisons constitute a wholly distinct class, which, however, only interests those architects who concern themselves with prison construction and, therefore, will not be described in detail herein.

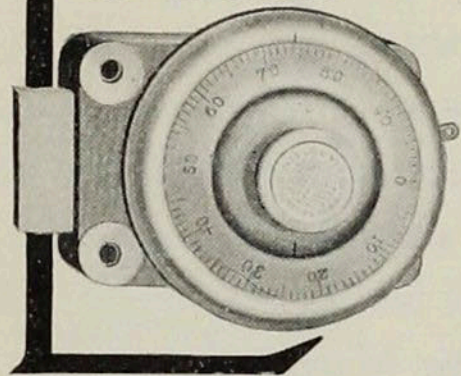
The Yale & Towne Manufacturing Company has for twenty-five years made a specialty of locks for Prison use, the conditions of which are entirely special and call for unusual care in designing and unusual thoroughness of construction. The line of prison locks includes a series of the Yale type, of special and very heavy construction, and also locks of the lever-tumbler type, both with solid and barrel keys, thus affording opportunity for a wide range of selection, whether governed by individual preference or surrounding conditions.

A catalogue of Prison Locks will be furnished on request. Correspondence is solicited concerning such locks and in reply full information, together with drawings, samples, and other useful data will be submitted if desired. The most approved forms of Prison Locks require to be built into the walls during construction, for which reason their selection needs to be made at an early stage.

## Section 34.

### Bank and Safe Locks.

# LOCKS



FOR the doors of Burglar and Fire-proof safes and vaults constitute a group not only distinct from all others but also pre-eminently the highest in technical excellence of all included within the art of the modern lock-maker. The fact that the modern architect is now often called on, in connection with plans for bank

buildings, to include vault work and its fastenings in his specifications, justifies a somewhat detailed reference to Bank locks in this volume.

The locks embraced in this group comprise Time, or Chronometer, locks; Dial, or Combination, locks; Safe Deposit locks; and "Sub-treasury" locks. The device known as a "Bolt-motor," or "Automatic," is an allied product. The essential characteristics of each of these will be briefly described; for fuller particulars reference is made to a special catalogue issued by the Yale & Towne Manufacturing Co., whose business originally consisted exclusively in the designing and making of Bank locks, of which product it is still the oldest manufacturer in this country, and the largest in the world, its experience extending over more than half a century, and its facilities embracing a most extensive practical knowledge of the art, the most modern and complete equipment, and the skill of numerous experts and specialists. This experience and knowledge is at the disposition of architects and engineers, and should be availed of in the selection of locks and the preparation of specifications.

**TIME-LOCKS** (Fig. 1).—The Time-lock is a locking mechanism actuated by clock work, and used in connection with the heavy bolt work of a safe door to prevent the unlocking of the latter except during predetermined hours. The Yale time-lock has been in use upward of twenty-five years, and is now recognized

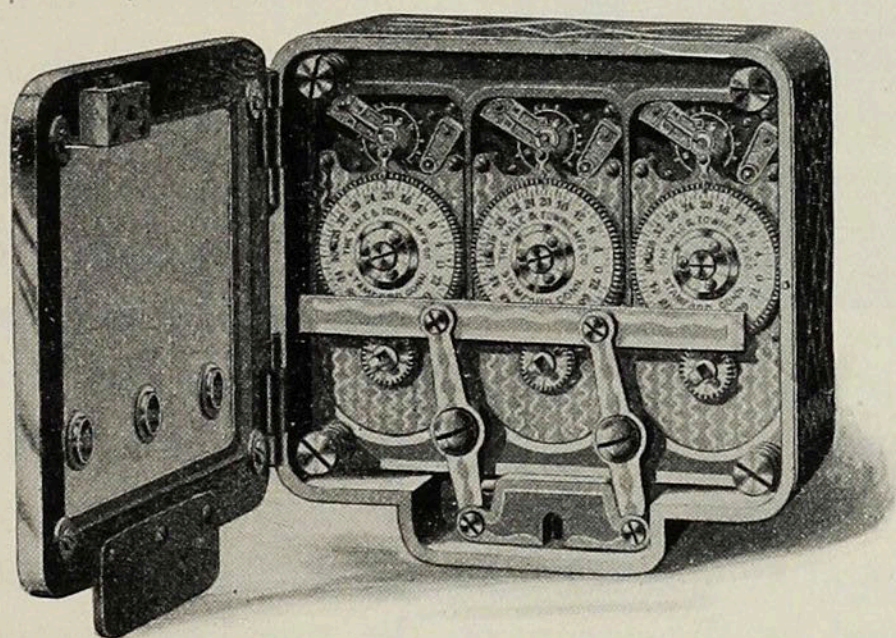
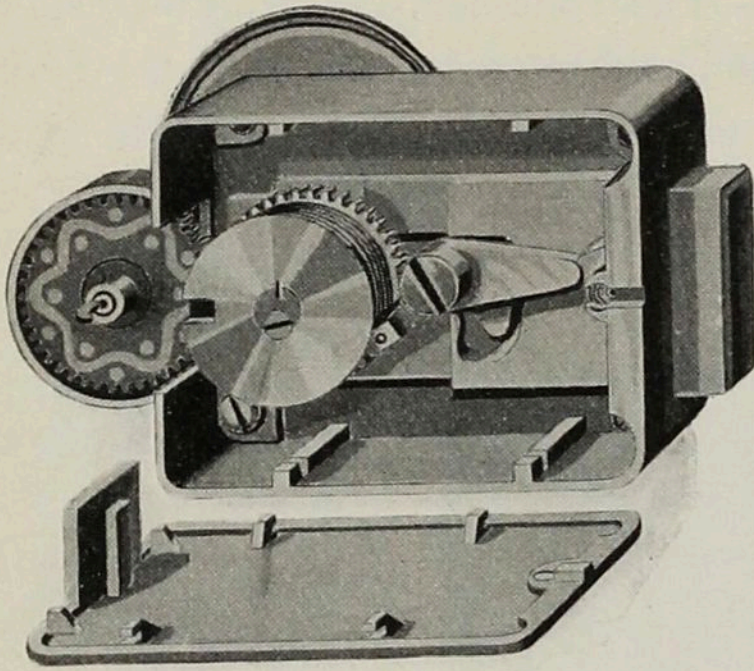


Fig. 1. Yale Time-lock with 3 Chronometer Movements.

as an essential part of the equipment of all first class burglar-proof vaults and safes. In its standard form it has three chronometer movements, of the finest construction, each competent alone to actuate the lock, thus affording a guaranty, which experience has shown to be absolutely reliable, for the proper functioning of the lock.

**DIAL OR COMBINATION LOCKS** (Figs. 2 and 3).—In America the Combination, or, as it is commonly called, the Dial lock, has completely superseded the key lock for use on safe and vault doors. Essentially the Dial lock consists of a bolting mechanism (usually employed to check the heavy bolt work of a safe door) guarded by a set of changeable tumblers or wheels, and actuated by a spindle passing through the door provided on the outer end with a graduated dial, by rotating which in a certain manner the tumblers can be set and the lock be operated. Dial locks are made of two grades or varieties, designed respectively for burglar-proof and for fire-proof safes, the former being heavy, elaborate and intended to resist violence, while the latter are



smaller, simpler and cheaper, being intended only for fire-proof doors not designed to resist great violence. All of them are, or should be, *absolutely unpickable*.

**BOLT MOTORS.**—In connection with the time lock an automatic bolt operating device has for

some ten years been extensively used on burglar-proof safes. The bolt motor is a mechanism attached to the inside of a safe door, containing heavy springs which are set or compressed while the door is open, and which, when released by the action of the time-lock always associated with the bolt motor, are capable of automatically retracting the heavy bolt work of the door. This construction obviates the necessity of any spindle through the door, and leaves the surface of the latter absolutely unbroken, and without communication between the interior and exterior.

**SAFE DEPOSIT LOCKS.**—The great development of safe deposit vaults in America has brought into existence a new type of lock intended expressly for the individual safes or boxes rented by the safe deposit company to its customers. Such locks are nearly always provided with a guard-key, in charge of the custodian and common to all of the

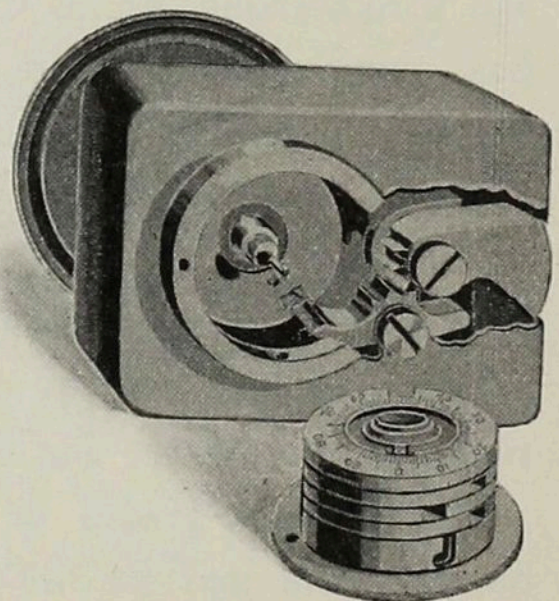


Fig. 2. Yale Dial Lock for *Fire-proof* Safes.



locks in a series, each lock having also an individual key, which fits only its own lock and differs from every other key in the series, the latter being known as the change-key. Before a change key can be inserted or used in its lock the guard mechanism must be unlocked by the guard-key in charge of the custodian. The presence of the latter is thus an essential preliminary to the unlocking of a lock, even by a box renter or other authorized person in possession of the proper change-key.

A variety of styles and sizes of Safe Deposit locks is made to meet varying conditions, the highest type being the Yale lock with paracentric key. Great additional security is obtained in some cases by keys of special proprietary forms. For Safe Deposit Boxes of large size a Dial lock is sometimes used.

**SUB-TREASURY LOCKS.**—This term is applied to locks intended for use on the small inside safety chests, or “Sub-treasuries,” often placed within a fire-proof safe. Such locks are of various types and sizes, and are suitable for use on metal doors of *all kinds*.

## Section 35.

### Post Office Lock Boxes.



Yale P. O. Lock Box.

THE Americans were the first to appreciate the convenience of equipping a post office with individual mail boxes, and the "call box" has long been a feature in post offices in the United States, and is still largely in evidence in country towns and villages. The invention of the Yale lock, however, with its great security and vast capacity for key-changes, led to the introduction, about 1870, of the metallic lock box, and ultimately to its general adoption in all of the larger post offices and in many of the smaller ones.

The Yale & Towne Manufacturing Company has, for some twenty-five years, been the contractor to the United States government for furnishing the Yale Lock Boxes used in all government post offices, and these boxes have also been furnished generally to postmasters throughout the United States and to many foreign governments. They are now in daily use in more than ten thousand post offices.