The present invention relates to an arrangement for mounting window sashes in a frame and permitting the position of the sashes in the frame to be adjusted.

Counterweights have been commonly used to mount window sashes in frames so that they may be moved between closed and open positions and will reliably remain in any desired position. However, the use of counterweights involves considerable extra expense in manufacture and installation as well as from a maintenance point of view. To eliminate counterweights, numerous types of locking devices have been proposed which are mounted on the sash and which are manipulable so as to engage portions of the frame, thereby to hold the sash in adjusted position. Most are independent of the means employed to mount the sash in the frame, and are operable in a few preslected positions of the sash.

A different type of locking device is shown in Flicker Reissue Patent 24,552, reissued October 21, 1958 and entitled “Window Sash Mounting and Locking Arrangement.” The mounting and locking arrangement there disclosed is highly advantageous, since it not only serves to mount the sash in the frame, but also permits the sash to be locked against downward movement in any position, the arrangement being such that the greater the downward force exerted on the sash, the more effective is the resistance exerted by the locking mechanism to prevent such downward movement. The sash can, however, be readily lifted, and it may be lowered upon appropriate manipulation of an actuating handle. As disclosed in that patent, the sash may be removed from the frame only when it is in a predetermined vertical position, the frame rail being provided with apertures through which the sash mounting mechanism can pass in escaping from the rail for that purpose. The mounting and locking structure disclosed in the said Flicker patent includes a lock member comprising a rod or shaft which extends out from the sash and is received within a passageway in the frame rail, that rod being mounted on the sash so as to be rotatable about its axis and carrying a downwardly inclined tooth at its portion received within said passageway. That tooth normally engages with an inner surface of said passageway, thus preventing downward movement of the sash while permitting free upward movement thereof. Appropriate rotary actuation of the handle causes the rod to rotate so as to withdraw the tooth from the passageway surface, thereby permitting the sash to be lowered.

The present invention has for its prime object providing an improved actuating mechanism for a rotatable window sash lock mechanism. It is particularly well adapted for actuation of a lock member of the type exemplified by the rotatably mounted tooth-carrying rod of the aforementioned Flicker Reissue Patent 24,552, but it is not necessarily limited thereto.

One drawback of the actuating mechanism disclosed in the said Flicker patent is that the handle therefor projects beyond the sash and must be moved out of the plane of the sash in order to release the locking mechanism. This arrangement constitutes a source of possible damage to the bodies or clothing of individuals manipulating the window sashes or moving adjacent them. The structure involved is susceptible to breakage, it permits the application of excessive forces which tend to damage or distort its parts, and its manipulation involves somewhat cumbersome physical actions. For example, the handle members must be lifted when the sash is to be lowered. Moreover, the appearance of sashes provided with the actuating mechanism under discussion leaves much to be desired in the way of neatness and trimness.

The Flicker mounting and locking arrangement has an additional drawback, in that the sashes can be disengaged from the frame only when said sashes are in particular predetermined vertical positions. It is a further prime object of the present invention to devise a lock and handle assembly which, whether used with a locking mechanism of the type exemplified by the aforementioned Flicker Reissue Patent 24,552 or with some other type of sash mounting and locking arrangements, eliminates the above specified disadvantages. In particular, all of the parts are mounted on the sash in an inconspicuous manner and preferably in a non-projecting, housed and protected manner. The construction, interconnection and arrangement of parts is such that excessive force cannot readily be applied, and if large forces are applied they are taken up by sturdy fixed parts of the assembly which are capable of withstanding such forces without damage or distortion. A simple lateral movement of the handle portions is effected to release the locking mechanism and permit the sash to be moved downwardly. Moreover, when it is desired to remove the sash from the frame, additional movement of the handle beyond the position required to release the locking mechanism is effective to withdraw the locking mechanism completely from the frame and thus permit the sash to be separated from the frame, and this no matter what the vertical position of the sash relative to the frame. The above results are accomplished, according to the present invention, by a structure formed of a minimal number of sturdy parts which are easily manufactured on a production basis and which do not require any particularly close dimensioning in order to function properly and effectively.

More specifically, the locking mechanism includes a lock member carrying a tooth element such as a tooth, the lock member being mounted on the sash so that the tooth-carrying portion thereof extends out beyond the sash and is normally received in a vertical passageway in the frame, the tooth being designed to engage with an inner surface of that passageway. The lock member is both rotatable and laterally movable relative to the sash, rotation of the lock member from its normal position being effective to withdraw the tooth carried thereby from engagement with the inner surface of the frame passageway, lateral movement of the lock member relative to the sash causing bodily withdrawal of the tooth-carrying part thereof from the frame passageway, thereby permitting removal of the sash from the frame. To accomplish the above movements in a sequential manner, first rotating the lock member so that the sash can be lowered and then laterally withdrawing the lock member so that the sash can be removed from the frame, an actuating member is provided which is movable from a first operative position through a second operative position to a third operative position, movement thereof from said first to said second operative position causing the lock member to rotate and thus release the locking mechanism, further movement of the lock member from its second to its third operative positions causing the locking member to move laterally, thereby to withdraw itself from the frame and permit the sash to be removed. Preferably the actuating member, in moving from its first through its second to its third operative position, does so in a single substantially smooth continuous movement, such as a straight line
lateral movement. The mechanism is biased so that the actuating member or handle is normally in that position which corresponds to the locking engagement of the lock member with the frame.

To accomplish the desired movements the operative connection between the actuating member and the lock element includes a lateral lost motion connection which is nevertheless effective to cause rotational movement of the lock member, said lost motion connection being active as the actuating member is moved from its first to its second operative position. Thereafter the operative connection between the actuating member and the lock member, insofar as lateral movement is concerned, is substantially identical to that continued lateral movement of the actuating member causes corresponding lateral movement of the lock member. Means may be provided which effectively prevents or inhibits lateral movement of the lock member until it has rotated to its lock-releasing position.

To the accomplishment of the above, and to such other objects as may hereinafter appear, the present invention relates to the construction of a lock and handle actuating assembly for a window sash or the like, as defined in the appended claims and as described in this specification, taken together with the accompanying drawings, in which:

FIG. 1 is a front elevational view of a window frame equipped with sashes having a mounting and locking arrangement actuating means constructed in accordance with the present invention, a portion of the upper sash being broken away for illustrative purposes;

FIG. 2 is a three-quarter perspective exploded view of the parts of the mounting and locking arrangement and the actuating means therefor;

FIG. 3 is a fragmentary end elevational view of the lower end of a sash, showing the structure of the present invention and showing the sash in position inside a passageway on the frame; and

FIGS. 4 and 5 are cross sectional views taken respectively along the lines 4—4 and 5—5 of FIG. 3 and showing the mounting and locking arrangement and actuating means therefor in normal locking position.

As here disclosed a lower sash generally designated 2 and an upper sash generally designated 4 are mounted within a window frame, generally designated 6, for vertical and sidable movement, the lower sash 2 being mounted in front of the upper sash 4, as is conventional. The frame 6 comprises side rails 8, a top rail 10, and a sill 12 defining a rectangular enclosure and mounted in any suitable manner in an outer framework 14 adapted to be secured within an appropriate enclosure in a building wall or the like. The side rails 8 are defined by a side wall 16 (see FIG. 3) from which flanges 18, 20 and 22 extend in stepped manner, the flange 18 being wider than the flange 20 and the flange 20 being wider than the flange 22. Thus vertical passageways 24 are defined between the flanges 18 and 20 and the flanges 20 and 22 respectively. The upper sash 4 is sidable over the inwardly projecting portion of the flange 18 and has parts extending laterally therefrom and slidably received within the passageway 24 between the flanges 18 and 20. The lower sash 2 slides on the inwardly projecting portion of the flange 20 and has parts extending laterally out therefrom and slidably received within the passageway 24 between the flanges 20 and 22, all as is generally conventional.

The lower sash 2 comprises a top frame member 26, a bottom frame member 28 and side frame members 30 between which a pane 32 of glass or the like is secured in conventional manner. The frame members are fastened together in any appropriate way. Conventional fixed lugs (not specifically illustrated in the drawings) extend out laterally from the upper corners of the sash 2 into the passageway 24 between flanges 20 and 22.

The mounting and locking arrangement of the present invention, including the actuating means therefor, is mounted at and adjacent the lower corners of the frame 2, the construction in each corner being substantially identical, so that a description of the mechanism in one corner will suffice for both corners. The actuating member 28 of the sash 2 is provided with a front wall 34 having an opening 36 which communicates with a space behind that front wall 34, that space extending from the outer end of the opening 36 toward the corresponding side of the sash 2. Within that space, and there secured in any appropriate manner, is a base member 38 designated 38. That base member, as here specifically disclosed, comprises a side wall 40, a top flange 42 and a bottom flange 44. Registering grooves 46 and 48 are formed in the facing surfaces of the flanges 42 and 44. The base member 38 is provided, at its end directed toward the opening 36, with an end wall 50 having an arcuate-bottomed opening 52 therein. A second end wall 54 is provided adjacent the other end of the base member 38, and it is provided with an arcuate-bottomed opening 56 aligned with the opening 52. Wall parts 57 and 59 are mounted in the inside of the top flange 42 and rearly extending passageway 61 being formed between them. The base member 38 is mounted with its side wall 40 parallel to, and preferably engaging and secured to, the inner surface of the front wall 34 of the sash member 28.

A lock member generally designated 58 is mounted on the base member 28. The lock member 58 comprises a shaft portion 68 from a longitudinally intermediate portion of which the finger 62 extends in a direction generally perpendicular to the axis of the shaft portion 68. The lock member 58 further comprises a part 64 carried at the end of the shaft portion 68 and laterally offset therefrom, that part 64 carrying a lock element 66 in the form of a laterally extending toothed part. The shaft portion 68 is received within and rests on the curved bottom surface of the apertures 52 and 56 in the base member end walls 50 and 54 respectively, the lock shaft portion 68 being both rotatable and longitudinally slidable relative to the base member 38.

The actuating member, generally designated 68, comprises a handle part generally designated 70 and an operating part generally designated 72, the parts 70 and 72 being longitudinally related to each other. The handle part 70 comprises a top wall 74 and an end finger piece 76. The operating part 72 comprises a top wall 78 (which may be continuous with the top wall 74), the edges of the top wall 78 being provided with lands 80 and 82 which are slidably receivable in the grooves 46 and 48 respectively of the base member 38, the top wall 78 being closing the opening 36 of the base member 38 and the top wall 74 of the handle portion 70 then being located in part opposite the opening 36 in the sash frame member 28. An end wall 84 extends from the top wall 78 adjacent a point where it meets the top wall 74, the end wall 84 being located outside the base member 38. At the left hand end of the operating part 72 is an end wall 86 provided with an arcuate-bottomed opening 88, the end wall 86 being located inside the end wall 54 of the base member 38, the shaft portion 60 of the lock member 58 being freely receivable inside the opening 88. A pair of wall sections 90 and 92 are carried by the top wall 78 adjacent the end wall 86, a passageway 94 being defined between the wall sections 90 and 92, which passageway is inclined relative to the length of the actuating member 58. The passageway 94 is of a size such that the finger 62 extending upward from the shaft portion 68 of the lock member 58 is received therein and slidably therethrough, the finger 62 extending beyond the passageway 94 so as to be receivable in the passageway 61.

A compressed spring 96 is mounted between the end wall 50 of the base member 38 and the end wall 86 of the actuating member 72, therefore biasing the actuating
member 68 to the left as viewed in the drawings, the actuating member end wall 86 then abutting the base member end wall 54 and the actuating member end wall 84 being positioned close to the base member end wall 59. As may be seen in FIGS. 2 and 5, the actuating member end wall 84 engages the end of the shaft portion 60 of the lock member 58, thus positively ensuring that lock member 58 is moved to the left so that its part 64 extends out beyond the base member 38. In this condition the part 64 will also extend out beyond the side of the shaft 22 and will be received within the passageway 24 between the frame flanges 29 and 22. The positioning of the actuating member 68 to the left will also cause the finger 62 extending up from the lock member 58 to be received in the right hand portion of the passageway 90 and in the passageway 61, thus causing the shaft portion 60 of the lock member 58 to assume a locking rotative position relative to the base member 38, that is, a position in which the toothed lock element 66 is swung outwardly and pointed downwardly, thereby (see FIG. 3) engaging the inner surface of the flange 22 while at the same time forcing the front portion of the sash member 28 to engage the inner surface of the flange 20. The sash will thus be frictionally retained in its adjusted position, and the digging action of the toothed lock element 66 into the flange 22 will effectively prevent the sash from moving downwardly, whether under the action of gravity or under manually exerted pressure. However, the sash can be manually lifted at any time without special actuation of the locking mechanism, the toothed lock element 66 sliding freely over the inner surface of the flange 22 during such a lifting movement. The spring 96, in acting on the actuating member 68 and causing that member to move to the left, ensures that the lock element carrying part 64 extends properly into the actuating passageway 24 and also ensures that it is rotated to proper locking position. If now it is desired to lower the sash the operator inserts fingers through the openings 36 at each end of the sash frame member 28, engages the end finger pieces 76, and moves them toward one another. Having reference to the assembly at the left hand corner of the sash 2, this movement of the actuating member 68, in the direction of the arrow 98, draws the wall sections 92 and 94 in that direction and thus causes displacement of the finger 62 of the lock member in the direction of the arrow 100 (see FIGS. 2 and 4). Since the shaft portion 60 of the lock member 58 to which the finger 62 is secured is constrained against moving laterally by virtue of the engagement between the finger 62 and the passageway 61, the shaft portion 60 will rotate in a counterclockwise direction as viewed in FIGS. 2 and 3, thus swinging the toothed lock element 66 away from the frame flange 22 and thereby releasing the locking action thereof and permitting the sash to be lowered.

If it is desired to remove the sash 2 from the frame 6, the parts 64 of the lock member 58 are withdrawn into the sash 2, and out from the frame passage 24 so as to clear the forward flange 22. This is accomplished by moving the actuating member 68 inwardly beyond its locking releasing position. When the actuating member 72 is moved sufficiently far in the direction of the arrow 98, the finger 62 will reach the inner and closed end of the passage 94, that passage 94 then defining an end stop engageable with the finger 62. When it is thus positioned the shaft portion 60 will have rotated sufficiently so that the finger 62 carried thereby is no longer within the passage 61 between the wall parts 57 and 59. Further lateral movement of the actuating member 72 in the direction of the arrow 98 will move the lock member 58, including its part 64, in the same lateral direction, all of this being accomplished against the biasing action of the spring 97. Thus the lock member parts 64 will retract into the sash 2, the lower end of the sash 2 may be swung forwardly out from the frame 6, and the lateral projections at the upper corners of the sash 2 may then be released from the sash 6 by tilting the sash laterally.

The upper sash 4 may be constructed similarly to the lower sash 2, if desired. It will be seen from the above that the mechanism of the present invention is simple, sturdy and exceptionally effective for its desired purposes. All of the mechanism may be housed within the sash frame, there being protected against damage to itself and rendered ineffective to cause damage or injury to persons or other objects, while at the same time permitting the construction of a sash having an exceptionally neat and uncluttered appearance. Manipulation of the actuating member for locking and unlocking purposes is readily accomplished, and in a manner not inappropriately related to the nature of the desired frame movement. The size and extent of the opening 36 through which access may be had to the finger piece 76 may be so designed as to make it virtually impossible to exert excessive forces on the finger piece 36, thus effectively preventing mistreatment of the mechanism. Moreover, in view of the essential sturdiness of the parts of the mechanism, and particularly those parts to which external forces can be transmitted, the possibility of damage or dislocation is greatly minimized.

While but a single embodiment of the present invention has been here specifically disclosed, it will be apparent that many variations may be made therein, all within the scope of the present invention as defined in the following claims.

I claim:

1. A lock and handle assembly for a window sash or the like comprising a base member, a lock member rotatably and longitudinally movably mounted thereon and having a part carrying a lock element which is normally exposed to said base member, an actuating member operatively connected to said base member and movable substantially linearly relative thereto from a first operative position to a second operative position, said lock member and said actuating member for causing said lock member to rotate without substantial longitudinal movement and movement of said actuating member between said first and said second operative positions and to move longitudinally and movement of said actuating member between said second and third operative positions.

2. The assembly of claim 1, in which said actuating member when in its first operative position is closer to the normally exposed position of said lock member than when said actuating member is in said second operative position.

3. The assembly of claim 1, in which said means operatively connecting said lock member and said actuating member comprises a projection on one of said members, the other of said members having a passageway in which said projection is received, said passageway being inclined with respect to the direction of movement of said actuating member between said first and said second operative positions, said passageway having an end stop engageable with said projection as said actuating member moves from said second to said third operative position, movement of said projection in said passageway causing rotation of said lock member while said actuating member translates relatively thereto, engagement between said projection and said end stop causing translation of said lock member with said actuating member.

4. The assembly of claim 1, in which said means operatively connecting said lock member and said actuating member comprises a projection on one of said members, the other of said members having a passageway in which said projection is received, said passageway being inclined with respect to the direction of movement of said actuating member between said first and said second operative positions, said passageway having an end stop engageable with said projection as said actuating member moves from said second to said third operative position, movement of said projection in said passageway causing rotation of said lock member while said actuating member translates relatively thereto, engagement between said projection and said end stop causing translation of said lock member with said actuating member.
with said projection as said actuating member moves from said second to said third operative position, movement of said projection in said passageway causing rotation of said lock member while said actuating member translates relative thereto, engagement between said projection and said end stop causing translation of said lock member with said actuating member, said actuating member when in its first operative position being closer to the normally exposed position of said lock member than when said actuating member is in said second operative position.

5. A lock and handle assembly for a window sash or the like comprising a base member, a lock member rotatably and longitudinally movably mounted thereon and having a part carrying a lock element which is normally exposed relative to said base member, an actuating member operatively connected to said base member and movably substantially linearly relative thereto from a first operative position through a second operative position to a third operative position, said first and third operative positions being extreme positions relative to said second operative position, means operatively connected to said actuating member for biasing it toward an extreme operative position, and means operatively connecting said lock member and said actuating member for causing said lock member to rotate without substantial longitudinal movement upon movement of said actuating member between said first and second operative positions and to move longitudinally upon movement of said actuating member being in said first and second operative positions.

6. The assembly of claim 5, in which said actuating member when in its first operative position is closer to the normally exposed position of said lock member part than when said actuating member is in said second operative position.

7. A lock and handle assembly for a window sash or the like comprising a base member having an end wall with an aperture, a lock member rotatably and longitudinally movably mounted in said housing and having a part normally extending through said aperture and beyond said end wall and carrying a lock element, an actuating member operatively connected to said base member for movement relative thereto from a first operative position through a second operative position to a third operative position, means operatively connected to said actuating member for biasing it toward said first operative position, said base member having an aperture and said lock member having a finger received in said aperture, movable therein as said lock member rotates, but engageable therewith so as to prevent longitudinal movement of said lock member, and means operatively connecting said lock member to said actuating member for causing said lock member to rotate so as to move said finger out of said aperture in said base member upon movement of said actuating member between said first and second operative positions and for causing said lock member to move longitudinally so as to cause said first portion thereof to move into said aperture in said housing end wall upon movement of said actuating member between said second and third positions.

8. The assembly of claim 7, in which the said actuating member when in its first operative position is closer to said housing end wall than when said actuating member is in said second operative position.

9. The assembly of claim 7 in which said means operatively connecting said lock member and said actuating member comprises a projection on one of said members, the other of said members having a passageway in which said projection is received, said passageway being inclined with respect to the direction of movement of said actuating member between said first and second operative positions, said passageway having an end stop engageable with said projection as said actuating member moves from said second to said third operative position, movement of said projection in said passageway causing rotation of said lock member while said actuating member translates relative thereto, engagement between said projection and said end stop causing translation of said lock member with said actuating member.

10. The assembly of claim 7, in which said means operatively connecting said lock member and said actuating member comprises a projection on one of said members, the other of said members having a passageway in which said projection is received, said passageway being inclined with respect to the direction of movement of said actuating member between said first and second operative positions, said passageway having an end stop engageable with said projection as said actuating member moves from said second to said third operative position, movement of said projection in said passageway causing rotation of said lock member while said actuating member translates relative thereto, engagement between said projection and said end stop causing translation of said lock member with said actuating member, and in which said actuating member when in its first operative position is closer to said housing end wall than when said actuating member is in its second operative position.

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ALBERT H. KAMPE, Primary Examiner.

THOMAS J. HICKEY, Examiner.