Aug. 30, 1932. S. M. GOODER 1,874,005

METHOD OF AND APPARATUS FOR RAISING ROOFS

Filed March 8, 1929 2 Sheets-Sheet 1

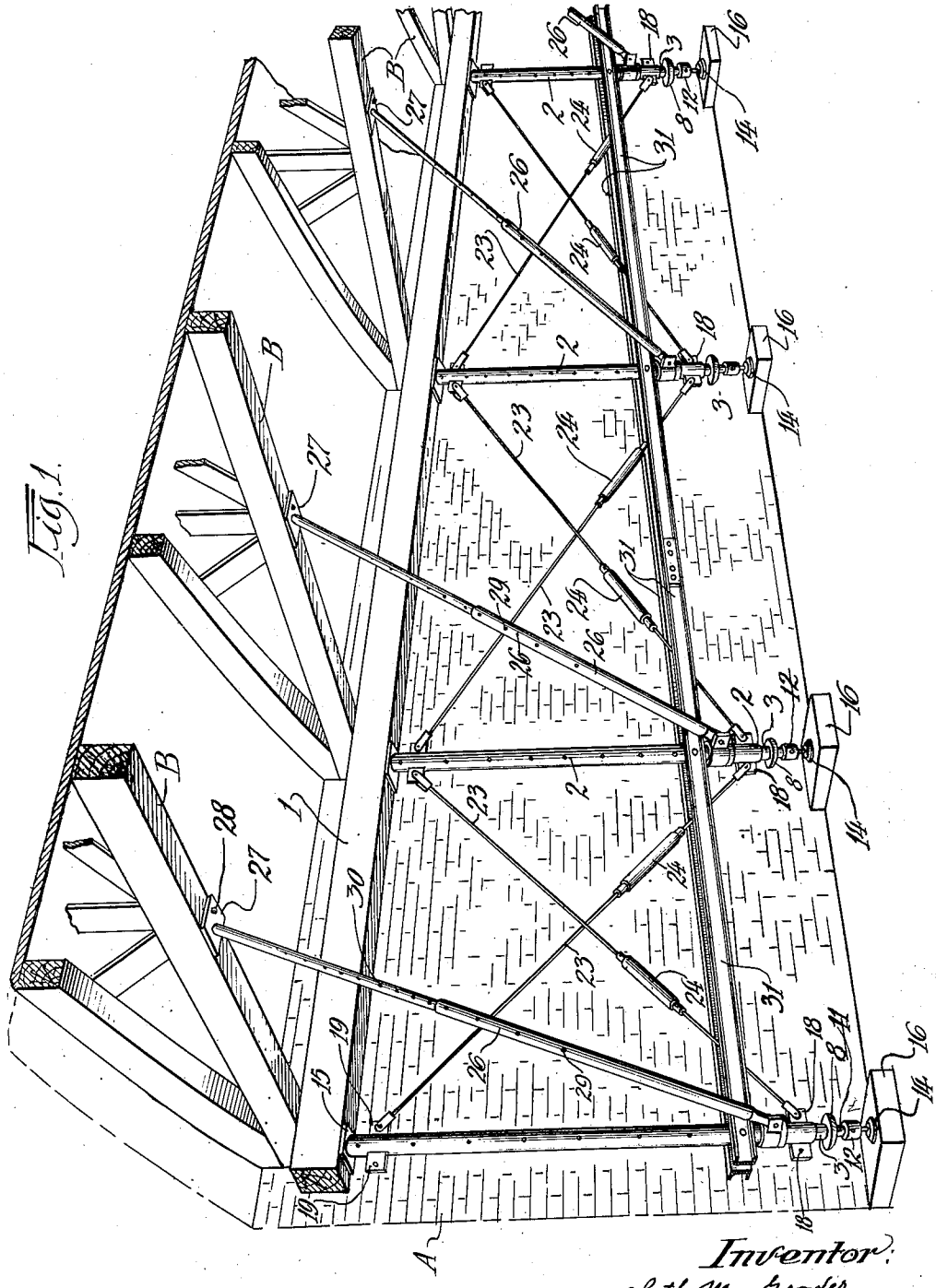

Fig. 1.

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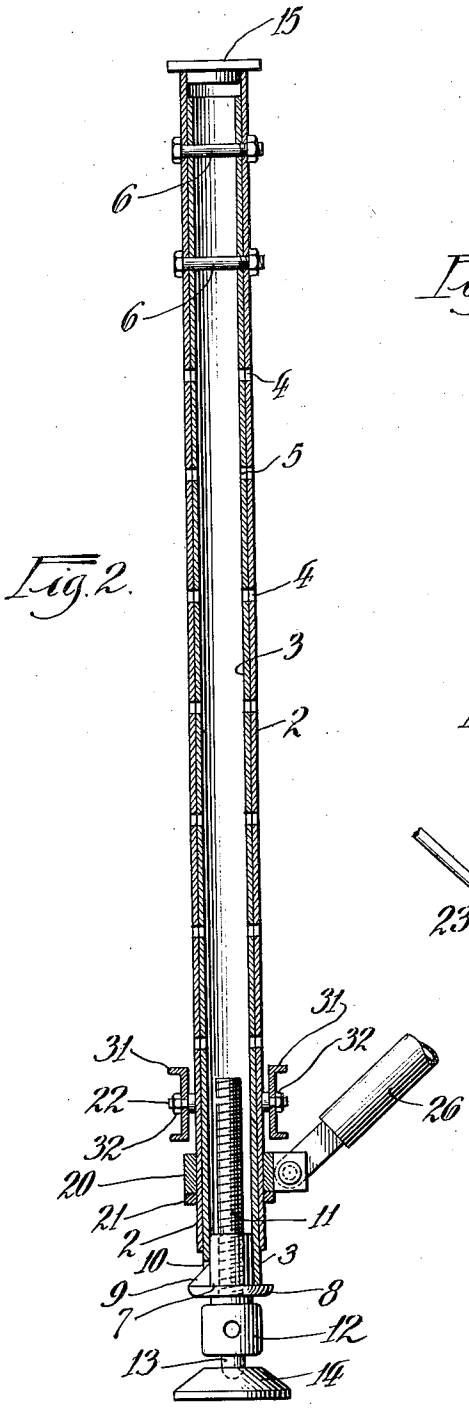

Fig. 2.

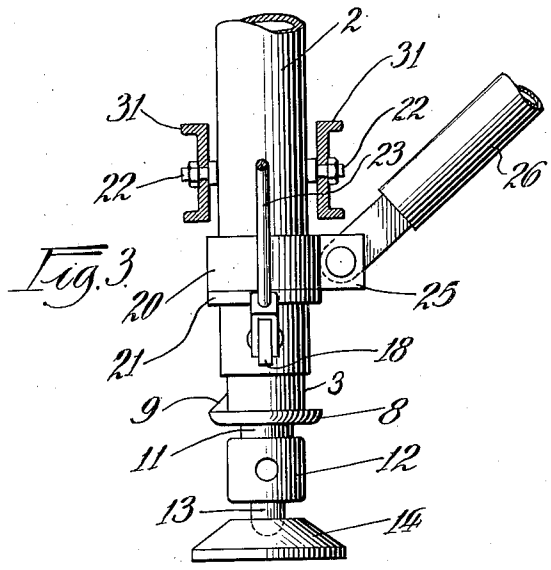

Fig. 3.

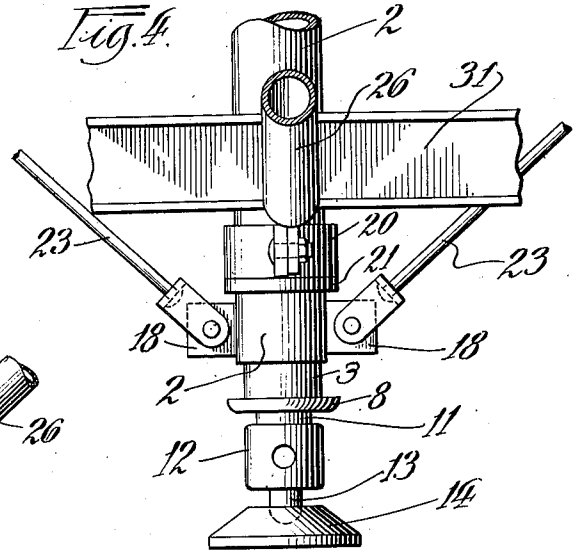

Fig. 4.

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UNITED STATES PATENT OFFICE

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METHOD OF AND APPARATUS FOR RAISING ROOFS

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It is sometimes necessary to raise the roof of a public garage in order to permit another story to be added. Garage roofs are usually supported on long transverse roof trusses. Heretofore the practice in raising roofs has been to build up piers underneath the ends of roof trusses, jacks being placed on these piers, and the height of the piers being gradually increased as the lifting progresses. These piers are usually made in the form of hollow crib-like structures that take up considerable floor space, and interfere with the normal use of the garage. The jacks, supported at about the center of the piers, will be located at a considerable distance from the corresponding ends of the trusses; and since the trusses are designed for supports at the ends, the shifting of the supports away from the ends, as is the case when the weight comes on the jacks under the old practice, sometimes results in serious injury to the trusses. Moreover, the workmen must climb up on the piers to operate the jacks.

The object of the present invention is to make it possible successfully to raise a roof by simple and novel means that will carry the roof trusses as near to the ends of the latter as the requirements for building on top of the old side walls permits, take up very little floor space and thus permit the normal use of the floor space while the roof is being raised, and permit the workmen to remain on the floor during the raising operation.

The various features of novelty whereby my invention is characterized will hereinafter be pointed out with particularity in the claims; but, for a full understanding of my invention and of its objects and advantages, reference may be had to the following detailed description taken in connection with the accompanying drawings, wherein:

Figure 1 is a perspective view of a side of a garage and a fragment of the roof, together with equipment for raising the roof in accordance with my invention; Fig. 2 is a vertical central section through one of the lifting jacks, on a larger scale than Fig. 1; and Figs. 3 and 4 are elevations of the lower end of the jack, showing what may be termed the side and the front, respectively.

Referring to Fig. 1 of the drawings, A represents the side wall of a garage or other building in which the roof is supported on long roof trusses, and B, B are the roof trusses. Along the wall, underneath the adjacent ends of the trusses, is placed a heavy beam 1, or a series of beams each long enough to span the distance between two of the trusses. This beam is supported on the upper ends of long jacks, one of which is placed under each truss. The jacks are of the type in which coarse adjustments may be made in the body of the jack itself, while fine adjustments are made with the jack screw. In other words, only a short screw is required to provide a lift of any desired height. As best shown in Fig. 2, the body of each jack is composed of two long telescoped tubes, an outer tube 2 and an inner tube 3. The outer tube has bolt holes 4 and the inner tube bolt holes 5. Any pair of bolt holes in the inner tube may be brought into registration with any pair of holes in the outer tube, permitting a bolt, such as indicated at 6, to be passed through both of the tubes and hold the tubes against relative lengthwise movements. At the lower end of the inner tube is a heavy nut 7, the body of which fits into the tube, while an annular flange 8 thereon rests against the bottom edge of the wall of the tube. The nut need not be fixed to the tube, but may be provided with an ear 9 that fits into a notch 10 in the tube to prevent relative rotation between the nut and the tube. A jack screw 11 extends through the nut and has on its lower end a head 12 by means of which it may be turned. The head may have a central boss 13 provided with a semispherical lower end adapted to fit into a socket in a stationary base 14, in order to provide a firm support for the jack screw and yet permit it to be freely turned. On the upper end of the outer tube is a suitable head 15 to engage with the work.

In using the jacks, the screws are turned into the nuts as far as they will go; the tubular body sections are adjusted so that the overall length of the jack will be slightly less than the distance between the underside of the beam 1, in Fig. 1, and the floor; and the

jacks, including the base members 14, are then placed beneath the beam, one under each roof truss. Unless the floor itself will form a suitable support for the bases of the jacks, I place blocks, such as indicated at 16, in position for the jacks to rest upon.

All of the jacks are tied together by means of diagonal tie rods; suitable struts or spacers are placed between the jacks; and a diagonal brace is positioned between each jack and the lower chord of the overlying truss. Consequently, when the jacks are operated slowly to lift the roof, the latter is firmly supported against any tendency to shift sidewise or endwise; both sides of the roof being, of course, supported in the same way.

The ties, braces, and struts are all connected to the outer tubes 2 of the jack bodies. Near the lower end of each of the outer tubes are a pair of diametrically opposed, projecting ears 18, while near the top of the tube are a similar pair of ears 19. The two sets of ears are in the same plane, so that all of these ears will lie in the plane containing the vertical axes of the jacks when the latter are set up as shown. Surrounding each jack body, above the ears 18, is a collar 20 that may turn about the vertical axis of the jack. If desired, an annular rib or flange 21 may be welded on the body of the jack just below the collar. Projecting from the outer tube of the body of the jack, a short distance above the loose collar, and at diametrically opposed, aligned points, are screwthreaded projections or pins 22. The common axis of the pins 22 is at right angles to the plane of the ears 18, so that one of the pins will be on the front side of the jack and the other at the back when the jack is placed in the position of any one of the jacks in Fig. 1.

The jacks are connected together by diagonal, crossing tie rods 23, each rod being pivotally connected at one end to an ear 19 on one jack, and at its other end to an ear 18 on the next jack of the series. Each tie rod preferably contains a turn buckle 24. Pivotally connected at its lower end to an ear 25 on the loose collar 20 of each jack is a brace 26. The free end of this brace has a head 27 that is adapted to fit against the underface of the lower chord of the corresponding roof truss, and be fastened to such chord by screws 28 or other suitable fastening devices. The brace is preferably made of two telescoping tubular members, the outer member of which is connected to the jack, while the upper and inner member carries the head 27. The two members of each brace are provided with a series of holes 29 and 30, respectively. In placing the brace in position, these two members are moved lengthwise relatively to each other until the proper overall length is secured, and then a pin or bolt is passed through registering holes in the two members so as to secure the latter together against relative endwise movements. The jacks are connected together by struts of which there are preferably two as indicated at 31, 31. These struts may conveniently be in the form of structural channel irons, one of which is placed behind and the other in front of the jacks. The webs of the channels are perforated to receive the screwthreaded pins 22. After the struts have been slipped over the pins, nuts 32 are applied to the latter and serve to hold the struts firmly in place.

It will be seen that the jacks are tied together in such a manner that the roof is held against swaying in the lengthwise direction. Furthermore, each jack, the corresponding diagonal brace, and that portion of the overlying truss extending between the upper ends of the jack and the brace, form a triangle whose sides are held against displacement relative to each other in the plane of the triangle, whereby the roof is stably supported against transverse swaying movements.

Assuming that the beams and the jacks have been placed in position on both sides of the building, the raising of the roof is carried out as follows: all of the jacks are operated so as gradually and evenly to lift the roof as far as this can conveniently be done by means of the screws. Then, while the roof is held up, the screws are backed off and the bodies of the jacks are extended to increase their original length by an amount equal to the distance through which the roof has been raised. The screws are then again operated to lift the roof through another step. These operations are continued until the roof has been raised to the desired height. If desired, a temporary jack may be placed in position to take the load off of each jack while the screw in the latter is being backed off and the body portion extended. However, I have found that no supports in addition to the lifting jacks themselves need be employed. If we consider the second jack from the left in Fig. 1, for example, it will be seen that the screw can be turned so as to raise the base 14 from the supporting block, or rather to permit the nut to drop down out of the body of the jack, without disturbing the latter. In other words, the body of the jack is suspended from the two tie rods that extend from the bottom thereof in opposite directions to the upper ends of the first and third jacks of the series. Consequently, if the turn buckles in the tie rods have been tightened so as to place these rods under an initial tension, the body of the jack and its load may successfully be carried by the tie rods while the jack is being adjusted so as to be ready for the next lifting operation. It will be seen that in lengthening the body of the jack, it is unnecessary to move the outer tube with respect to the roof, the ties, the brace, or the struts, since the inner tubes are simply dropped down, after the

fastening bolts between the two tubes are removed. The bolts are then put back in place, locking together the two telescoped members in their new relative positions. Then, upon turning the jack screw far enough to transfer the load from the tie rods to the bases of the jacks, the jack is not only ready to do its part in lifting the roof through the next stage, but it is adapted to help support the load on the jack next in line, while the latter jack is being backed off and its body lengthened.

It will be seen that a roof may be raised in accordance with my invention without the need of building up piers or using any instrumentalities that will take up any considerable amount of floor space, without endangering the integrity of the roof trusses, and without danger that the roof will be objectionably stressed in any part thereof.

While I have illustrated and described with particularity a simple apparatus that I have successfully employed in carrying out my invention commercially, including a common type of builders' jack having a lifting element in the form of a screw, I do not desire to be limited to the details thus illustrated and described; but intend to cover all forms and arrangements which come within the definitions of my invention constituting the appended claims.

I claim:—

1. The method of raising a side of a roof which consists in placing under the same a row of jacks having long extensible bodies composed of an upper section and a lower section provided with a lifting element, tying the lower end of each upper body section to the upper ends of the upper body sections of the two jacks between which it is placed, operating the lifting elements so as alternately to lift the roof and back off the said elements, each lifting element being backed off while the body thereof is being supported by the two nearest jacks, and the lower section of each jack body being lowered after the corresponding lifting element has been backed off.

2. An apparatus of the character described comprising a row of jacks, each jack having a long extensible body comprising an upper and a lower section, a lifting element associated with the lower section, and ties connecting the lower end of each upper body section to the upper ends of the bodies of the jacks lying on opposite sides thereof in the row.

3. An apparatus of the character described comprising a row of jacks, each jack having a long body comprising two tubes telescoped upon each other, means to hold the tubes against relative lengthwise movements in any one of various positions of adjustment, a lifting device on the lower end of each inner tube, and ties connecting the lower end of each outer tube to the upper ends of each of the two jacks between which it lies.

4. An apparatus of the character described comprising a row of jacks, each jack having a long body comprising two tubes telescoped upon each other, means to hold the tubes against relative lengthwise movements in any one of various positions of adjustment, a lifting device on the lower end of each inner tube, ties connecting the lower end of each outer tube to the upper ends of each of the two jacks between which it lies, and struts connecting the lower ends of the outer tubes together.

5. An apparatus of the charatcer described, comprising a row of jacks, each jack having a long body comprising two tubes telescoped upon each other, means to hold the tubes against relative lengthwise movements in any one of various positions of adjustment, a lifting device on the lower end of each inner tube, ties connecting the lower end of each outer tube to the upper ends of each of the two jacks between which it lies, and diagonal braces attached at their lower ends to the lower ends of the outer tubes and adapted to lie in planes at right angles to the plane of said row and be secured at their upper ends to the roof.

6. An apparatus of the character described comprising a row of jacks, each jack having a long extensible body comprising an upper and a lower section, a lifting element associated with the lower section, braces adapted to connect the lower ends of the upper sections of the jack bodies to the roof at points remote from the corresponding jacks, and means extending between corresponding sections of the jack bodies to produce a structure braced against distortion in the plane of said row.

In testimony whereof, I sign this specification.

SETH M. GOODER.