March 8, 1966 P. E. GOSTLING 3,239,188

SHUTTERING SYSTEM FOR USE IN BUILDING CONSTRUCTION

Filed March 11, 1964 3 Sheets-Sheet 1

Fig. 1.

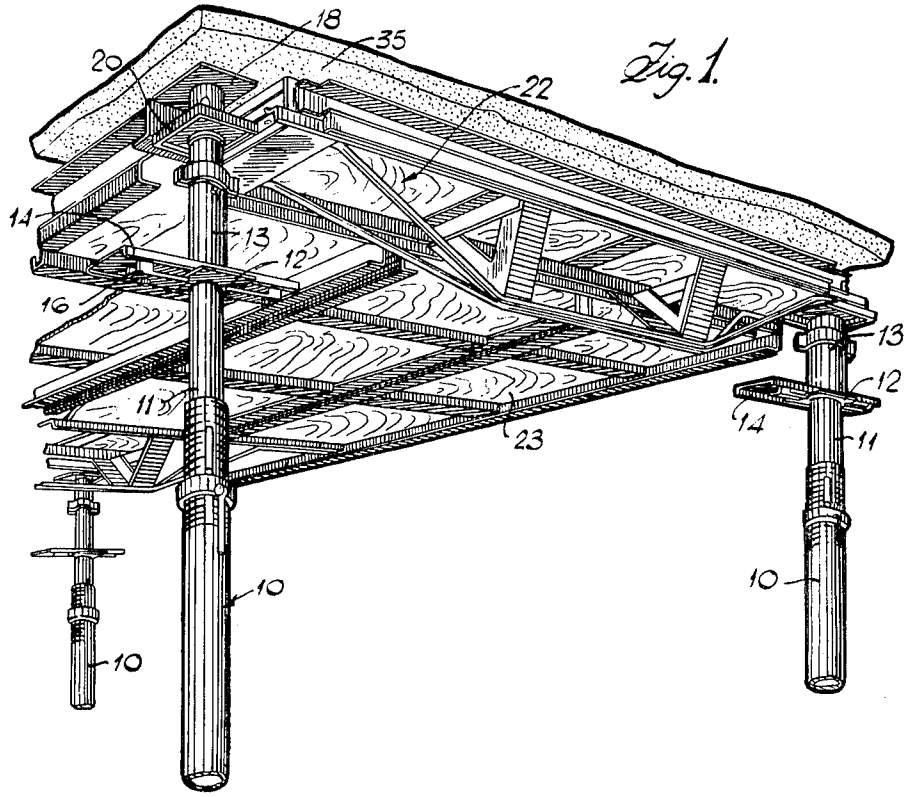
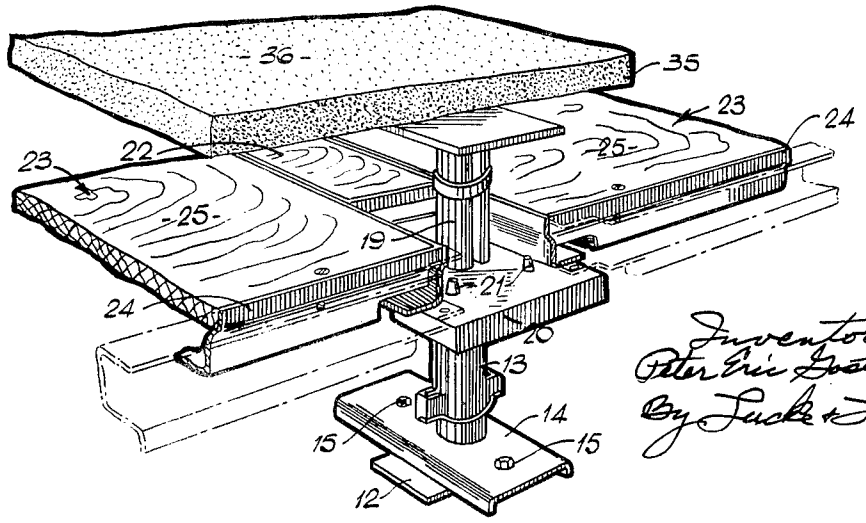



Fig. 2.




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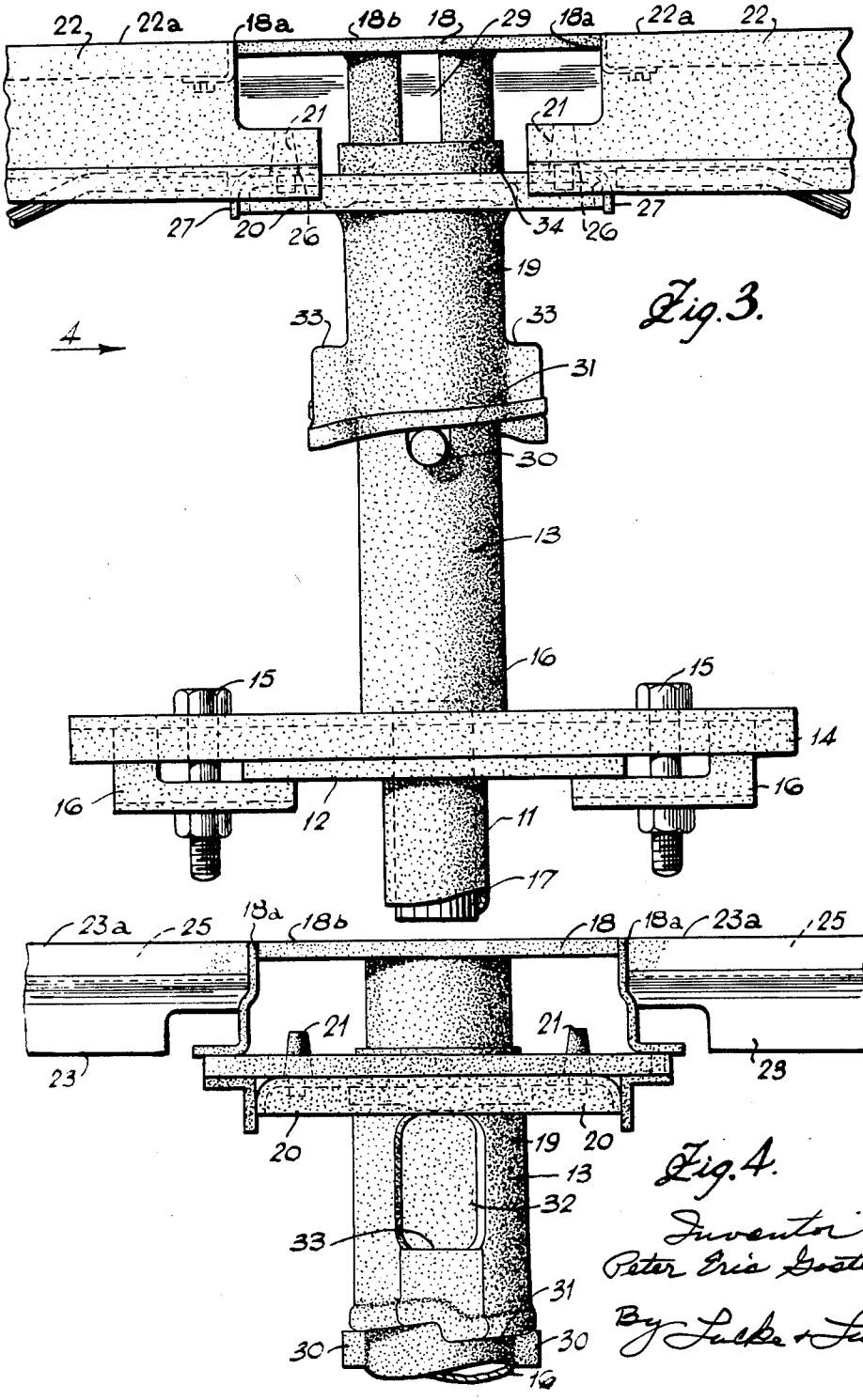



Fig. 3.

Fig. 4.

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SHUTTERING SYSTEM FOR USE IN BUILDING CONSTRUCTION

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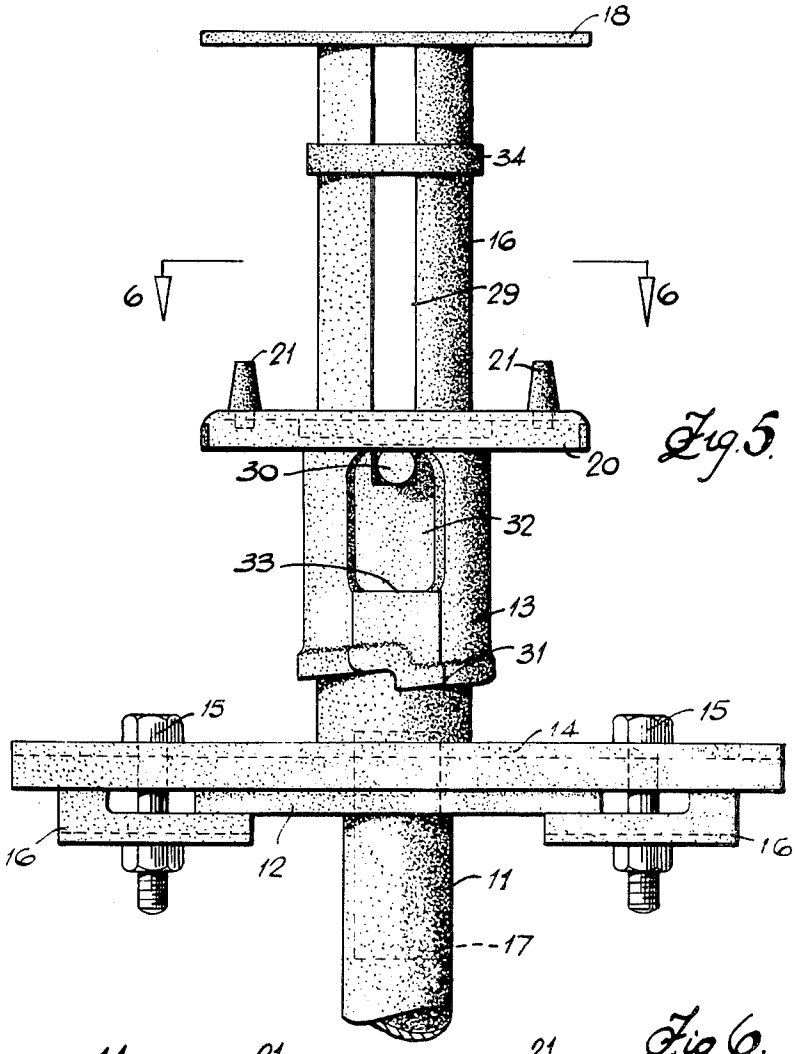



Fig. 5.

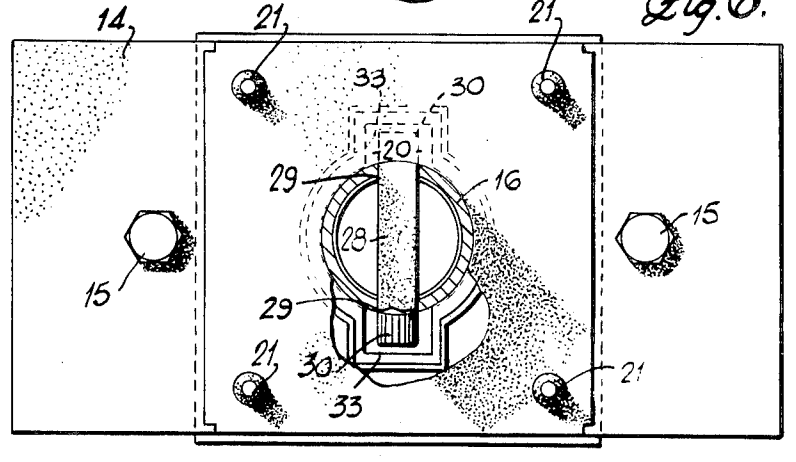



Fig. 6.

United States Patent Office 3,239,188 Patented Mar. 8, 1966



3,239,188

# SHUTTERING SYSTEM FOR USE IN BUILDING CONSTRUCTION

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Filed Mar. 11, 1964, Ser. No. 351,115
5 Claims. (Cl. 249—210)

This invention relates to a new or improved shuttering sytem for use in building construction and is concerned with shuttering for use in forming roofs, floors or ceilings of buildings and of the kind comprising a plurality of shuttering elements, and means for removably supporting these in a position for forming the roof, floor or ceiling from concrete or other settable material.

Except in the case of roofs, floors, or ceilings of extremely small span such as obtain in dwelling houses, the complete operation of forming a roof, floor or ceiling generally occupies a period of several days. Usually one to two days must be allowed for the erection of the shuttering, a day for the pouring of the concrete or other settable material, after which, it is at present necessary if any damage to the formed structure is to be avoided, for the shuttering to be left in situ for a period of time usually between seven and twenty one days and long enough to allow for the concrete or other material fully to set and harden. Thus the whole of the shuttering required to form the structure is in use for a period of between ten and twenty four days, and if the area of the roof or other structure to be formed is considerable, this means that a very substantial amount of costly equipment is unavailable for a further building operation until the expiration of this period, of between ten and twenty four days.

With a view to avoiding the retention of the whole of the shuttering in situ for the full period of between ten and twenty four days usually necessary if risk of cracking or other damage to the concrete or the like is to be avoided, from time to time builders completely dismantle the shuttering and its supports after a period of some three or four days following the pouring of the concrete and then re-position merely the shuttering supporting props. This is a most undesirable and dangerous practice as not only is the structure left temporarily wholly unsupported but when the props are replaced they may be so adjusted as to apply an unduly high pressure to the partially set structure, resulting in a re-positioning or even reversal of the stresses in the structure which is highly undesirable.

The present invention seeks to reduce substantially the overall time during which the whole of the shuttering must remain in situ without at the same time incurring any risk of damage to the roof or other formed structure.

The invention further comprises means for supporting shuttering elements of the kind hereinbefore specified comprising an extensible prop embodying a pair of relatively extensible upper and lower prop members, means for securing the prop members in the desired extended relationship, said prop being characterised in that the upper member thereof carries a shuttering member adapted to support a part of the roof, floor or ceiling to be formed at a position above the upper end of the prop, said upper member of the prop also carrying a shuttering element support adapted to support from the prop a plurality of shuttering elements in a position in which their concrete supporting face is flush with the corresponding face of the shuttering member, said shuttering element support being displaceable along the length of the prop relative to the shuttering member, the arrangement being such that after the roof, floor or ceiling has partially set and hardened, the shuttering element support on the prop can be lowered with the shuttering elements still supported by the shuttering element support and the shuttering elements removed, leaving for a further period the roof, floor or ceiling still supported locally by the shuttering member on the prop.



Preferably the shuttering members and the shuttering elements would be adapted on their respective concrete supporting faces to engage directly with the concrete; although if desired, a lining sheet such as a plywood sheet could be laid over the flush concrete supporting faces of the shuttering elements and shuttering members so as to avoid discontinuity in the support for the concrete at the junctions between the several shuttering elements as well as at the junction between the latter and the supporting members on the props.

In practice a number of props would be provided arranged in rows and with the spacing between the rows and the individual props in each row being so chosen as to provide the required support for the roof, floor or ceiling during its final setting and hardening after the shuttering elements have been removed.

In practice this spacing would be similar to that requisite for supporting shuttering elements in the existing practice in which it is necessary to leave shuttering elements in situ until the whole of the shuttering is removed, so that the additional cost of providing props in accordance with this invention is merely the cost of the additional adaption thereto required for the performance of the invention, and this is greatly offset by the saving in the time during which the shuttering elements are required to remain in situ, which saving in time is believed to be of the order of at least 30%. As the capital cost of shuttering elements for supporting a single roof, ceiling or floor commonly is of the order of several hundreds of pounds and may run into thousands of pounds, the economic advantage of the present invention will be self-evident.

Each shuttering member together with the shuttering element support may be connected non-detachably to the associated prop so as to form therewith a complete self-contained unit. Preferably, however, both the shuttering member and the shuttering element support of each prop is constructed separately from the prop so as to form part of a prop attachment which is adapted to be mounted detachably on the upper end of the prop, an arrangement which permits of the invention readily being applied to existing conventional forms of extensible props by providing merely prop attachments adapted for mounting thereon.

The invention is illustrated in the accompanying drawings wherein:

FIGURE 1 is a perspective view of part of a shuttering assembly for use in the construction of a concrete floor or ceiling or flat roof and embodying one form of the present invention, the parts being depicted in position immediately prior to the pouring of the concrete.

FIGURE 2 is a perspective view of part of the construction depicted in FIGURE 1 showing the position of the parts with the shuttering element supports and the shuttering elements supported therefrom lowered preparatory to removal after the concrete structure which has been formed has partially set and hardened.

FIGURE 3 is a side elevation of one of the prop attachments of the construction depicted in FIGURES 1 and 2, showing the prop attachment with its shuttering elements support in the raised position supporting the shuttering elements in position for supporting the concrete.

FIGURE 4 is a side elevation of part of a construction shown in FIGURE 3 looking in the direction of the arrow 4, with the parts being again depicted in the shuttering support position as shown in FIGURE 3.

FIGURE 5 is a view similar to FIGURE 3 but showing the position of the parts with the shuttering element support lowered preparatory to removal of the shuttering elements.

FIGURE 6 is a sectional view on the line **6—6** of FIGURE 5, with some parts broken away.

Referring to the drawings, for supporting the shuttering there depicted, there is provided a plurality of extensible props **10** which are of conventional telescopic tubular form with the upper tubular member **11** of the prop carrying on its upper end the usual thrust plate **12**.

For supporting the shuttering from the props there is provided in accordance with this invention, a plurality of prop attachments **13** each adapted to be mounted on the upper end of each prop **10**. Each prop attachment **13** comprises a base plate **14** which abuts against the upper side of the prop thrust plate **12**, the base plate **14** having a pair of dependent screws **15** which support clamps **16** for engaging with the underside of the thrust plate **12** at opposite sides of the prop **10**.

Each prop attachment further comprises an elongated body in the form of an upstanding tube **16** the lower end of which is secured to the upper side of the base plate **14** centrally thereof, each tube **16** as shown having a diameter larger than that of the upper tubular member **11** of the prop and carrying a dependent spigot **17** which extends within the upper end of the prop member **11**.

Each prop attachment tube **16** is of relatively short length conveniently of the order of 12″ to 18″ and has secured rigidly to its upper end a shuttering member **18** in the form of a square shaped plate, each edge of which may have a length of the order of 6″.

Mounted on the prop attachment tube **16** for axial sliding movement is a sleeve **1**, the upper end of which supports a shuttering element support **20** in the form of a centrally apertured flat plate supported from the upper end of the sleeve **19**, this plate being also of square configuration similar to that of the shuttering member **18** and being provided adjacent each corner thereof with an upstanding spigot **21** for connection to one of a number of shuttering elements. Each shuttering member **18** is disposed above the upper end of the associated prop including its attachment **13** so as to be adapted to engage the concrete structure at a position directly above the prop.

Such shuttering elements are of generally known type and as shown in FIGURES 1 and 2 are of two forms, namely combined shuttering elements and beams **22** herein referred to as shuttering beams, which extend in one direction between transversely adjacent prop attachments **13**.

The other form of shuttering element comprises panels **23** of square or rectangular configuration which extend between adjacent beams **22**.

Both the beams **22** and panels **23** are formed of timber, e.g., plywood sheets having edge reinforcements **24** of angle form in cross section, one flange of which is attached to the timber or plywood sheet **25** and the other flange of which in the case of the beams is formed at the ends of the beam with holes **26** for receiving one of the aforementioned spigots **21**. Thus the shuttering element beams **22** are located against horizontal movement both in relation to one another and to the props **10**.

The arrangement is such that in one direction as shown in FIGURE 2 the shuttering element panels **23** adjoin one another and in another direction there is left therebetween spaces to accommodate the shuttering beams **22**. The corners **27** of shuttering panels **23** are adapted merely to rest on the plate-like shuttering element supports **20**, and pins or other detachable fastening beams not shown are provided to connect the shuttering panels **23** detachably to the beams **22** at positions intermediate the ends of the beams where these extend between the panels.

The length of the beams **22** and the size of the panels **23** is such that with the shuttering elements **22, 23** in position as shown in FIGURE 3, they abut against one



or another of each of the four of two opposite pair of edges **18***a* of the shuttering members **18** with their upper, i.e. concrete supporting faces **22***a*, **23***a* flush with the upper, i.e. concrete supporting faces **18***b* of each shuttering member **18**.

Each sleeve **19** is free to turn relative to the shuttering element support **20** about the exterior of attachment tube **16**, the shuttering element support **20** which is separate from the sleeve **19** being adapted merely to slide axially along the tube **16** but being prevented from turning about the tube by providing the support **20** with a cross piece **28** see FIGURE 6, which extends diametrically through a pair of opposed slots **29** formed in the upper part of tube **16** and extending axially thereof.

Within the lower end of the pair of slots **29** is a diametrically extending sleeve supporting pin **30**, the two ends of which as shown in FIGURES 4 and 6 project beyond the exterior of the tube **16**.

The lower edge of the sleeve **19** at positions on diametrically opposite sides of the sleeve extends at an inclination to the horizontal as shown at **31** and these inclined edges **31** are adapted to engage with the upper side of the projecting ends of the pin **30** when the sleeve is in the upper shuttering element supporting position depicted in FIGURES 3 and 4.

The sleeve **19** at diametrically opposite positions is formed in its upper part with a pair of slots **32** and its lower part at a position below both of these slots **32** is locally of increased bore to provide, see FIGURE 6, a pair of axially extending openings in the form of recesses **33** which permit of the sleeve being slidden axially past the projecting ends of the pin **30** when as shown in FIGURES 5 and 6, the sleeve is turned into a position in which its recesses **33** are in register with the projecting ends of the pin **30**.

The pin **30** together with the lower edge **31** of the sleeve **19** and recesses **33** all constitute locking means for securing the sleeve **19** releasably in its upper or shuttering element supporting position.

As shown in FIGURES 3 and 4 each lower inclined sleeve edge **31** is inclined upwardly of the sleeve in a direction towards the lower end of each recess **33** and the arrangement is such that if viewing the sleeve **19** from above, it is turned in a clockwise direction so as to bring the lower end of each recess **33** towards the corresponding end of the pin **30**, the sleeve is progressively lowered slightly to relieve the pressure between the upper edge of the rotating sleeve and the underside of the non-rotating shuttering element support **20**; and the aforementioned inclination of the lower edge of the sleeve **19** facilitates therefore the turning of the sleeve into a position in which its two recesses **33** are in register with the projecting ends of the pin **30**, in which position as shown in FIGURE 5, the sleeve can be lowered, permitting of the shuttering element support **20** sliding downwardly of the tube **16** to disengage such support from the shuttering elements and permit of the latter being dismantled.

Downward movement of the sleeve **19** below the position depicted in FIGURE 5 is prevented by the arrangement of the projecting ends of the pin **30** with the upper edge of each slot **32**, while upward movement of the support **20** above the position depicted in FIGURE 3 is prevented by its engagement with the lower side of stop collar **34**, mounted permanently on the upper part of the tube **16**.

In operation the parts would all first be disposed in the position depicted in FIGURES 1, 3 and 4 with the props **10** arranged in rows as earlier described, in which position the upper, i.e. concrete supporting faces **22***a*, **23***a* of the two forms of shuttering elements **22, 23** are flush with one another and with the upper face **18***b* of each shuttering member **18**.

The concrete is then poured in the usual way, whereupon the whole assembly is left in the position described

until partial setting and hardening has occurred, for example, after a period of three days.

The sleeves **19** are now turned about the tube **16** so as slightly to lower the sleeves during the turning movement as earlier described until the sleeve recesses **33** are in register with the projecting ends of the pins **30**, whereupon the sleeves can be lowered into the position on the attachment tubes into the position depicted in FIGURES 2 and 5, thus simultaneously lowering the shuttering element supports **20** and shuttering elements **22**, **23** still supported through the supports **20** from the props **10** clear of the underside of the formed and now partially set concrete floor **35**, as shown in FIGURE 2.

The distance through which the supports **20** have thus been lowered is appreciably greater than the vertical depth of the spigots **21** as well as by a distance appreciably greater than the overall depth of the end portions of the shuttering beams **22** which can now be disengaged from the supports **20** by raising the beams clear of the spigots **21** and then displacing the beams **22** slightly in their direction of length so as to bring one end portion clear of the adjacent support **20** whereupon the beams **22** can be tilted slightly and lowered, thus providing clearance to permit of the panels **23** being displaced in a sideways direction out of register with the supports **20** and also lowered, thus leaving in position merely the shuttering members **18** still in thrust engagement with the underside of the concrete floor **35** and thus providing at spaced intervals support for the partially set concrete floor or the like.

An important and essential feature of this invention is that the shuttering element support **20** of each prop attachment when lowered into the position depicted in FIGURE 2, is still adapted to support the shuttering elements **22**, **23** in their lowered position above described. Such an arrangement possesses the important advantage that the shuttering elements can then be dismantled one at a time without it being necessary specially to support them during their dismantlement, apart from the support provided by the shuttering element supports **20**, whereas the provision of some special temporary supports would be necessary in the event that a removable connection common to several shuttering elements was removed, leaving the shuttering members in situ as described. Thus the present invention enables the shuttering elements to be removed in a particularly convenient manner and at the same time avoids any danger of the shuttering elements falling down when these are first lowered out of supporting engagement with the ceiling, floor or roof.

When the setting of the concrete is complete the props **10** would be retracted so as to bring the shuttering members **18** out of engagement with the concrete **35** which would then be removed and the dismantling of the shuttering and its supports would now be completed.

What I claim then is:

**1.** Means for supporting shuttering elements in the construction of roofs, floors and ceilings formed from concrete and other settable material, said means comprising an extensible prop embodying relatively extensible upper and lower prop members, a shuttering member supported on the upper prop member and having an upwardly directed concrete engaging face, a shuttering element support mounted on the upper prop member and slidably axially thereof between a lower inoperative position and an upper operative position for supporting a plurality of shuttering elements in a position flush with the corresponding face of the shuttering member support, interengageable abutment portions on the upper prop member and shuttering element support retaining the latter in its operative position, one of said abutment portions comprising an abutment face inclined to the horizontal, means mounting said abutment portions for relative turning movement about the longitudinal axis of the prop between an operative position in which said abutment portions interengage and a free position in which said abutment portions are disengaged from one another to permit of the shuttering element support being slidden downwardly relative to the prop and shuttering member supported thereon to effect lowering and removal of the shuttering elements.

**2.** Means according to claim **1** including a vertically extending elongated body mounted on the upper end of the upper prop member, a shuttering plate having an upwardly directed concrete engaging face on the upper end of said body, a sleeve mounted on said elongated body for axial sliding movement in a direction along the length thereof, said sleeve being rotatable around said body, said sleeve carrying means for supporting a plurality of shuttering elements, said sleeve having a downwardly directed lower edge which is inclined to the horizontal considering the attachment mounted on said prop, a lug on said body engaging said inclined sleeve edge, said sleeve having an axially extending lug receiving opening registerable with the lug in one rotational position of the sleeve to permit of the latter and associated shuttering elements being slidden downwardly relative to the shuttering member support when the concrete or other settable material has partially set.

**3.** A prop attachment for supporting shuttering elements in the construction of roofs, floors and ceilings formed from concrete and other settable material comprising a shuttering member in the form of a vertically extending elongated body adapted at its lower end for mounting on the upper end of a vertically disposed extensible prop and provided at its upper end with a shuttering member having an upwardly directed concrete engaging face, a sleeve mounted on said elongated body for axial sliding movement in a direction along the length thereof, said sleeve being rotatable around said body, said sleeve carrying means for supporting a plurality of shuttering elements, said sleeve having a downwardly directed lower edge which is inclined to the horizontal considering the attachment mounted on said prop, a lug on said body engaging said inclined sleeve edge, said sleeve having an axially extending lug receiving opening registerable with the lug in one rotational position of the sleeve to permit of the latter and associated shuttering elements being slidden downwardly relative to the shuttering member support when the concrete or other settable material has partially set.

**4.** A prop attachment for supporting shuttering elements in the construction of roofs, floors and ceilings formed from concrete and other settable material comprising a tube, means adapted to mount one end of said tube on the upper end of an extensible prop, a shuttering plate having an upwardly directed concrete engaging face mounted on the other end of said tube, a sleeve rotatable around said tube and carrying means for supporting a plurality of shuttering elements, said sleeve having a downwardly directed lower edge which is inclined to the horizontal considering the attachment mounted on said prop, a pin extending diametrically through said tube with opposite ends of said pin engaging said inclined sleeve edge, said sleeve having a pair of diametrically opposed axially extending openings each adapted to receive one end of said pin in one rotational position of the sleeve around said tube to permit of the sleeve and associated shuttering elements being slidden downwardly relative to said tube and shuttering plate when the concrete or other settable material has partially set.

**5.** A prop attachment according to claim **4**, wherein the sleeve at its upper end carries a plate constituting means for supporting a plurality of shuttering elements, said plate having a central aperture through which extends the tube, and upstanding shuttering element engaging spigots on said plate.

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