

E. R. BOYLE & W. B. UPTON.  
 REINFORCING MEANS FOR CONCRETE STRUCTURES.  
 APPLICATION FILED MAR. 25, 1908.

925,989.

Patented June 22, 1909.

2 SHEETS—SHEET 1.

Fig. 1.

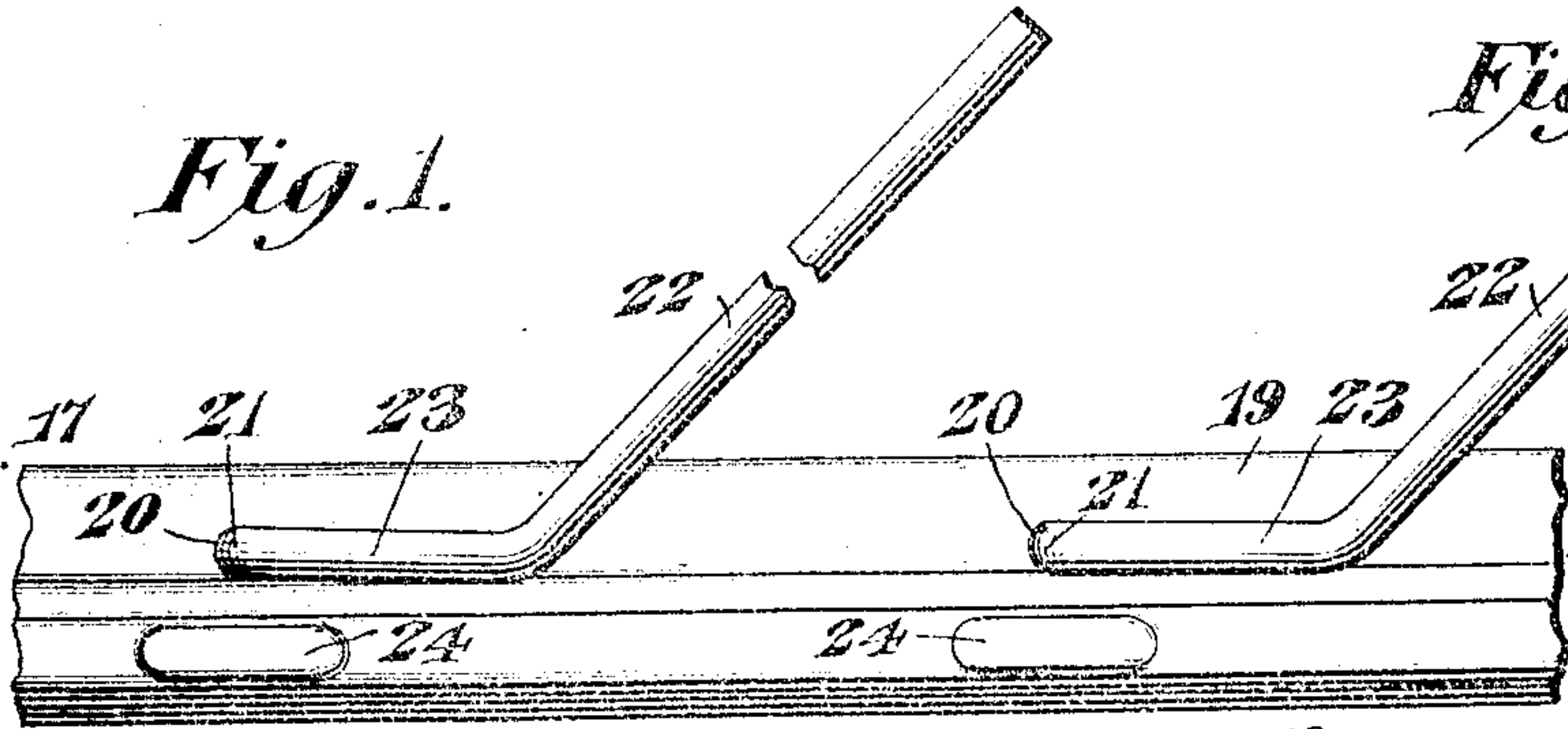


Fig. 2.

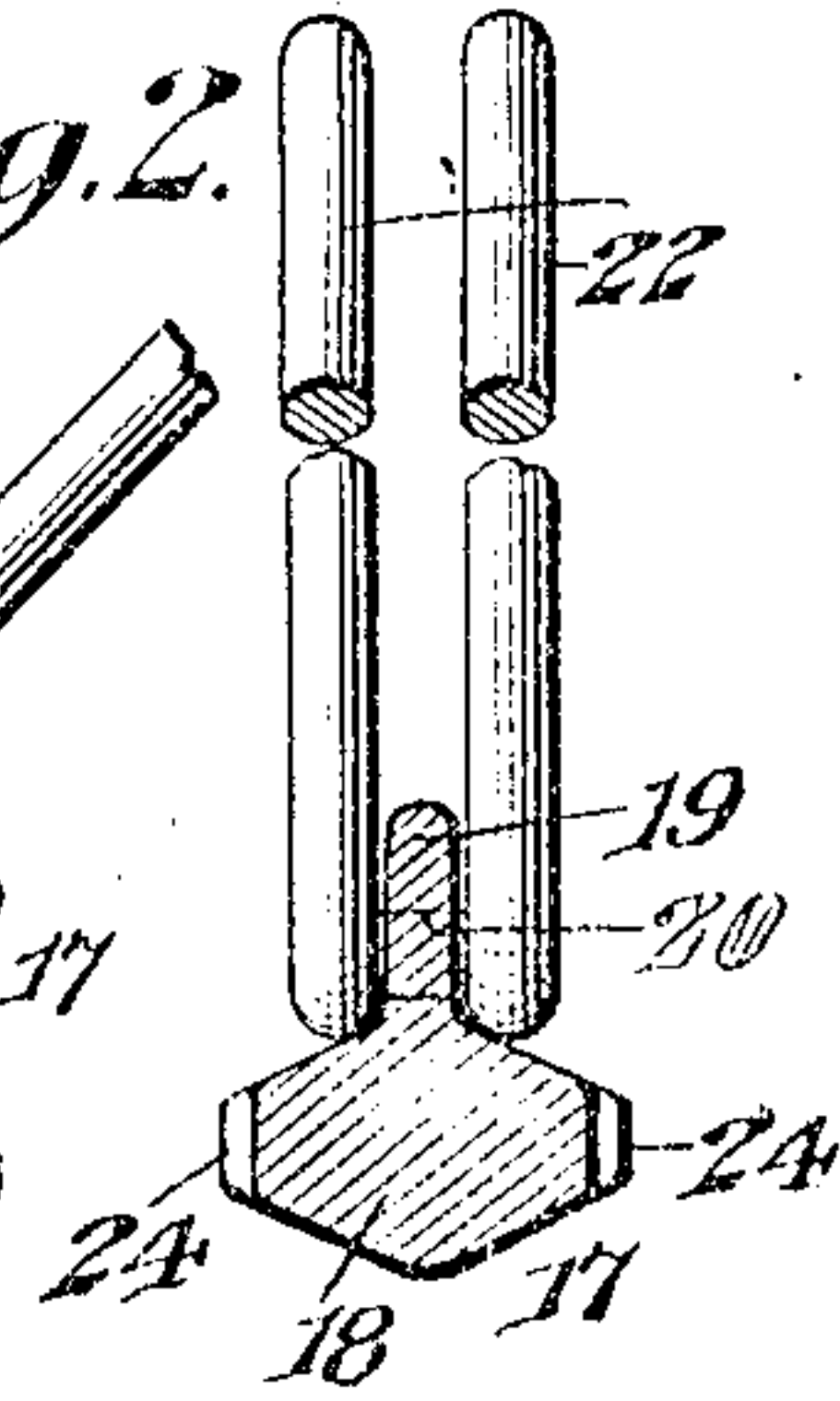


Fig. 3.

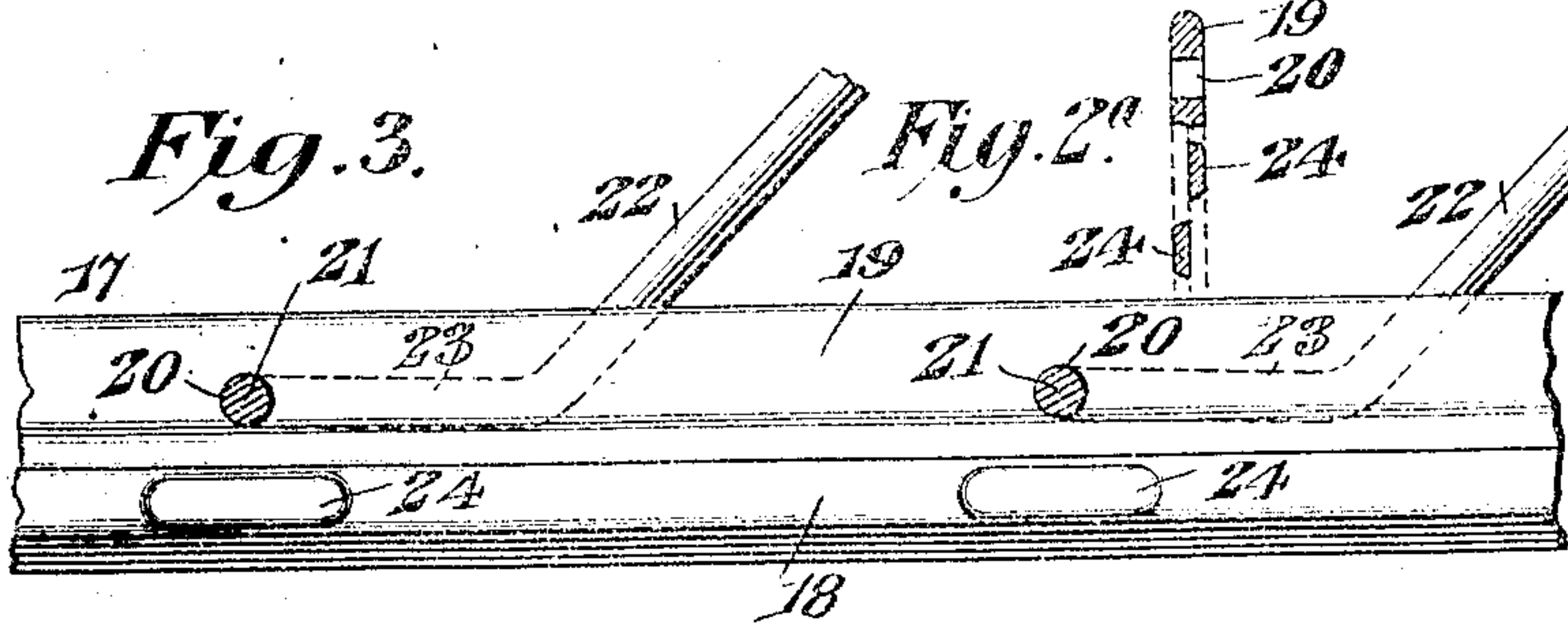


Fig. 2<sup>a</sup>.

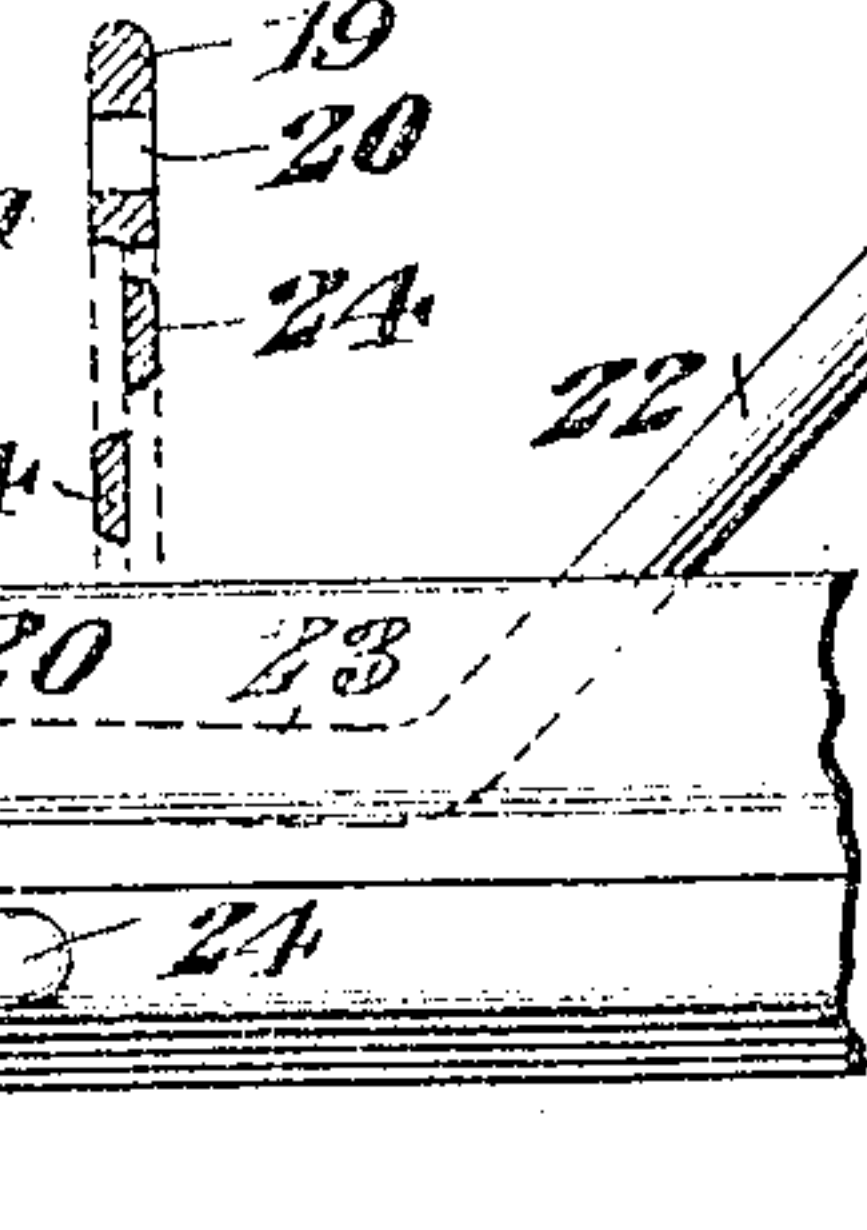


Fig. 4.

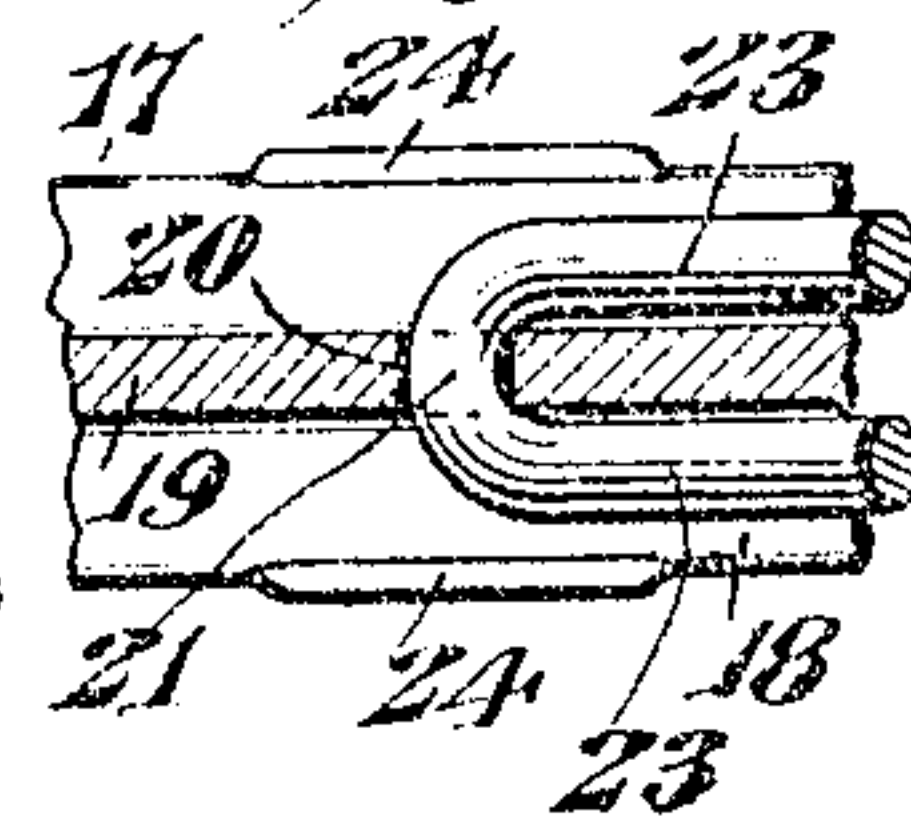


Fig. 5.

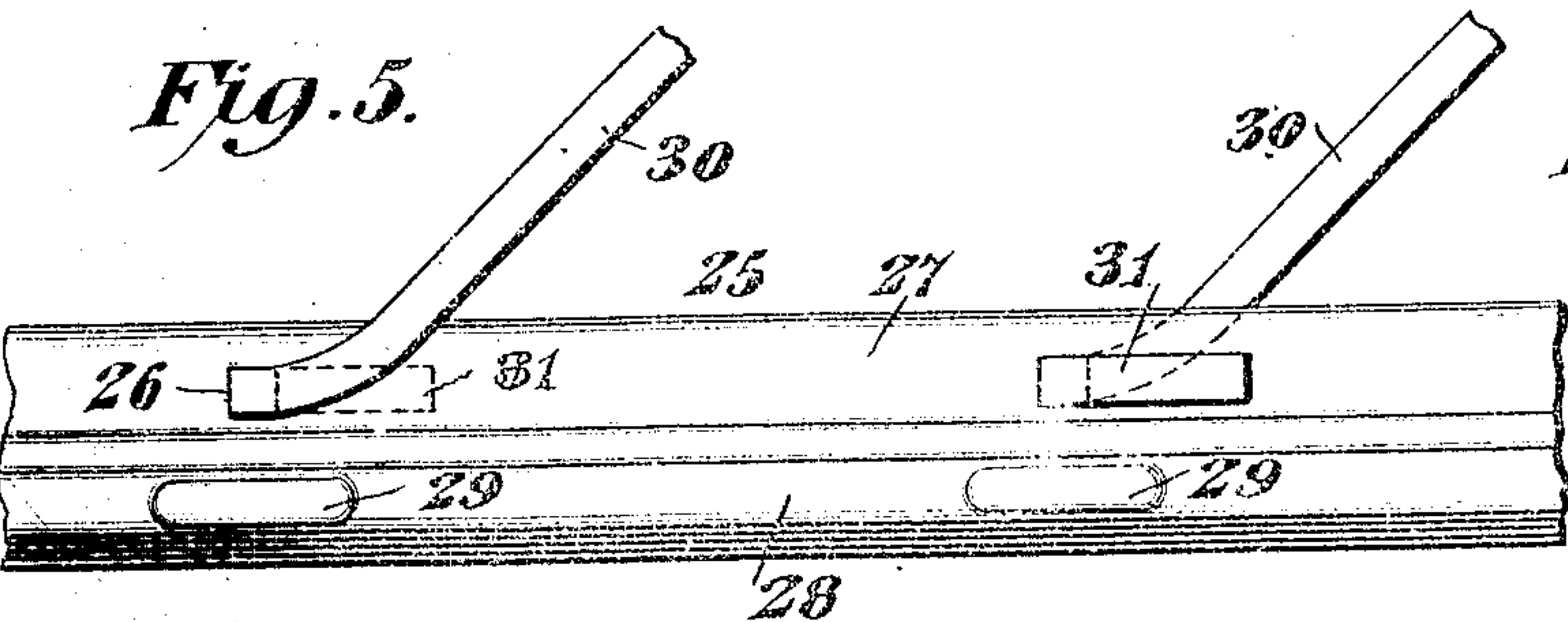


Fig. 6.

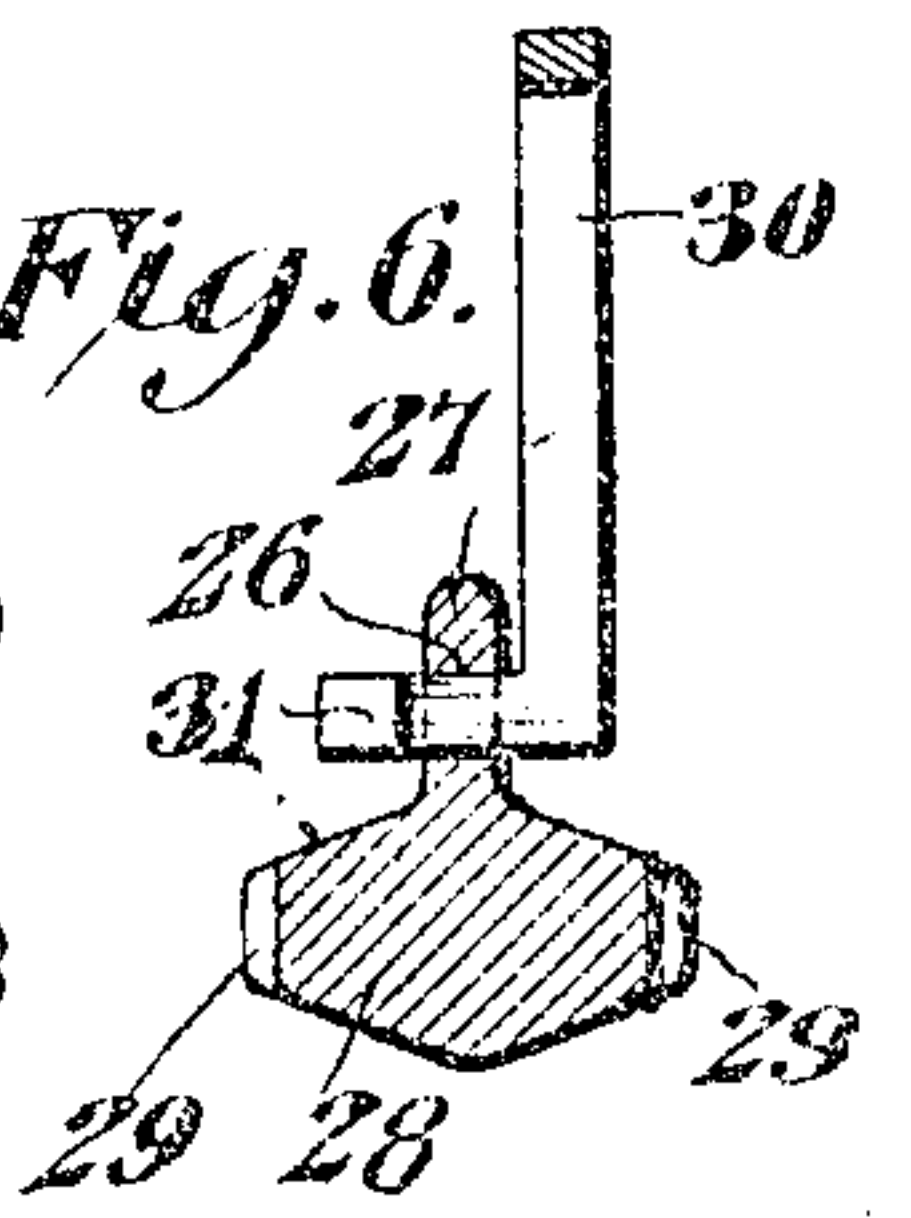


Fig. 7.

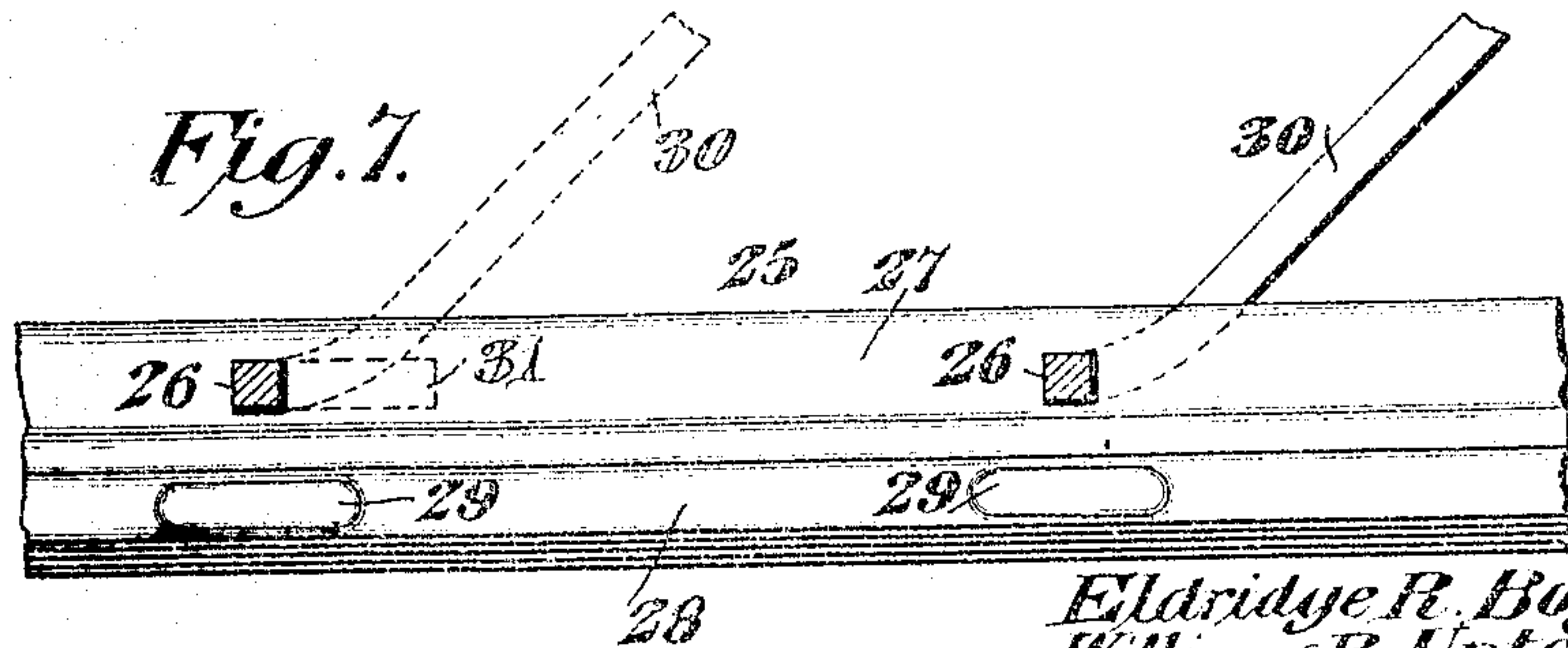
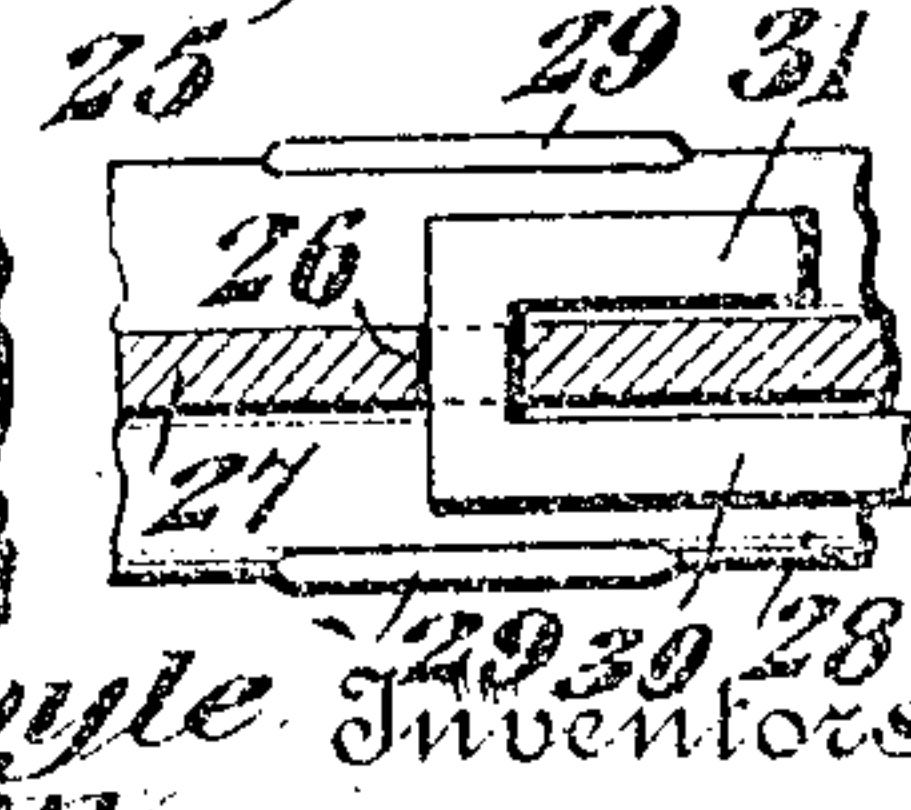


Fig. 8.



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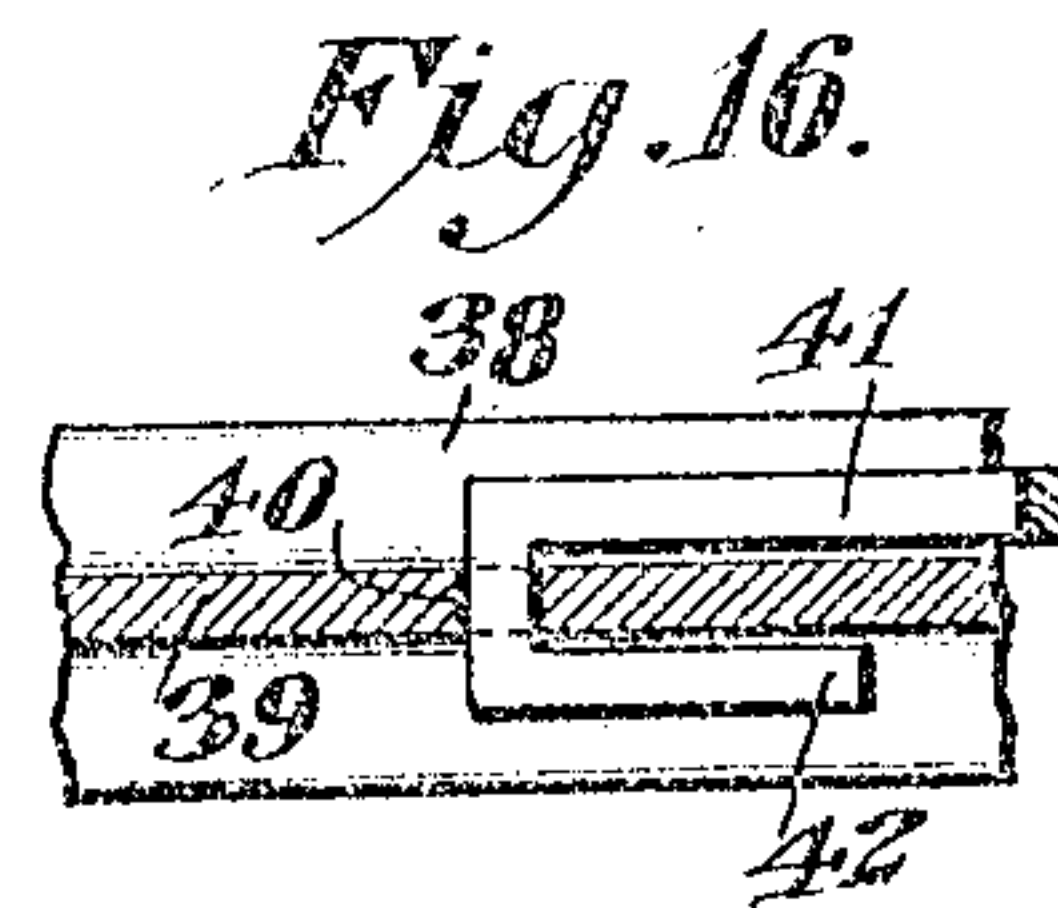
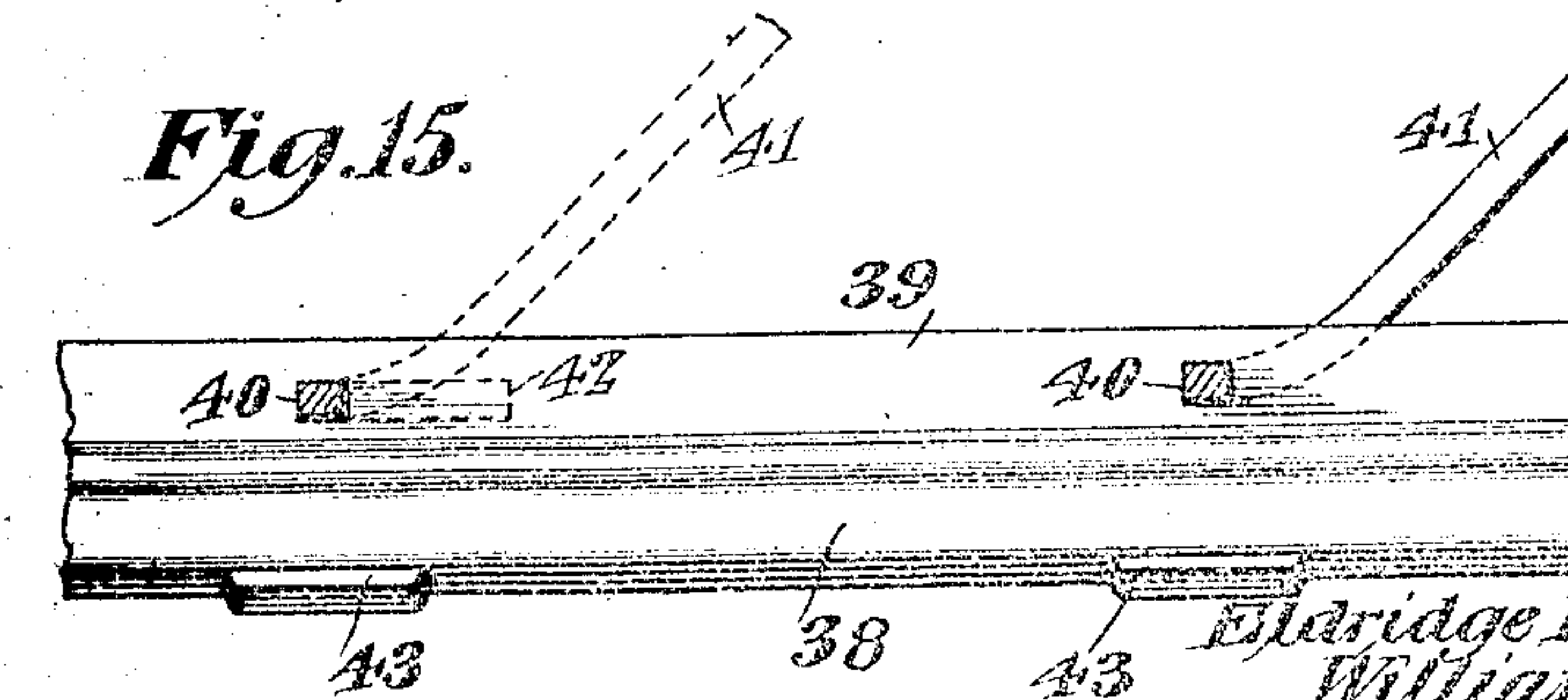
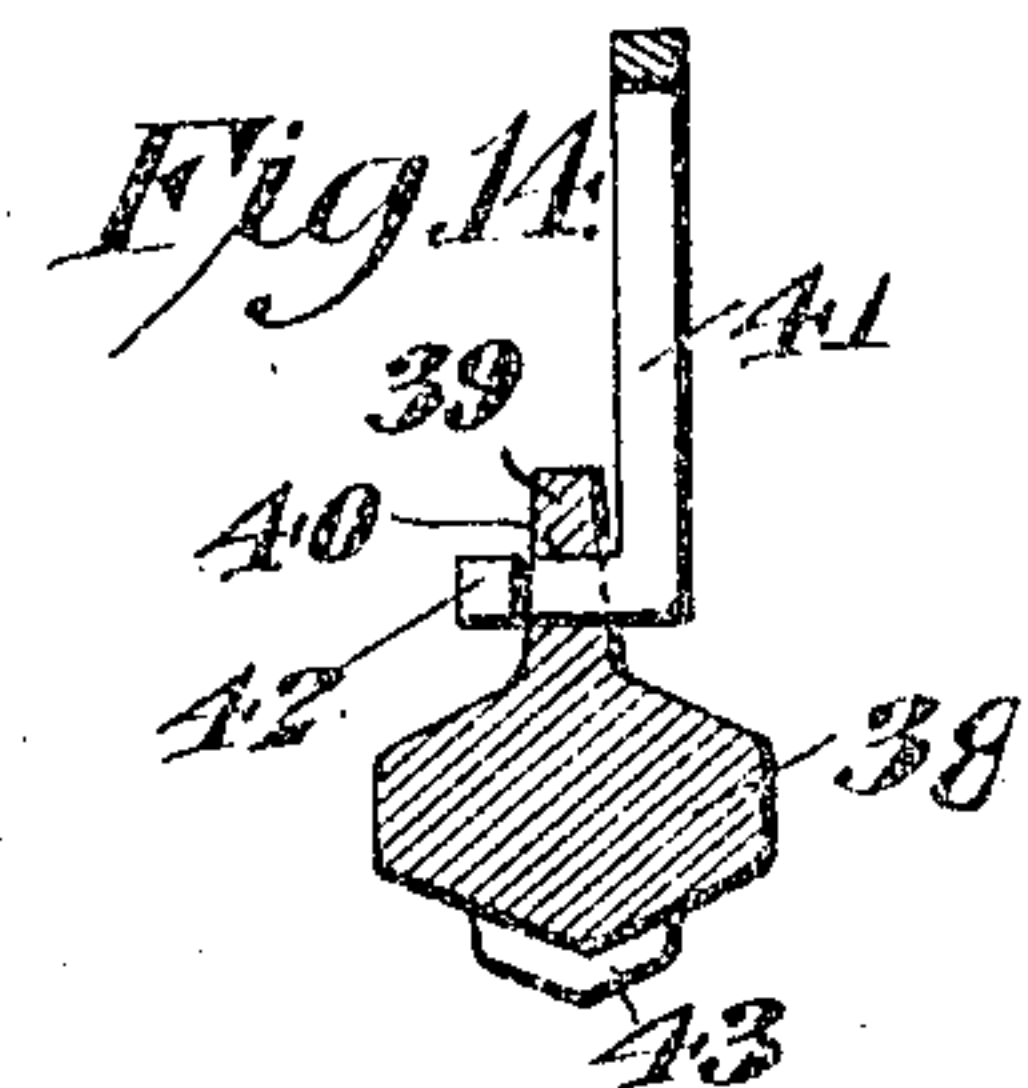
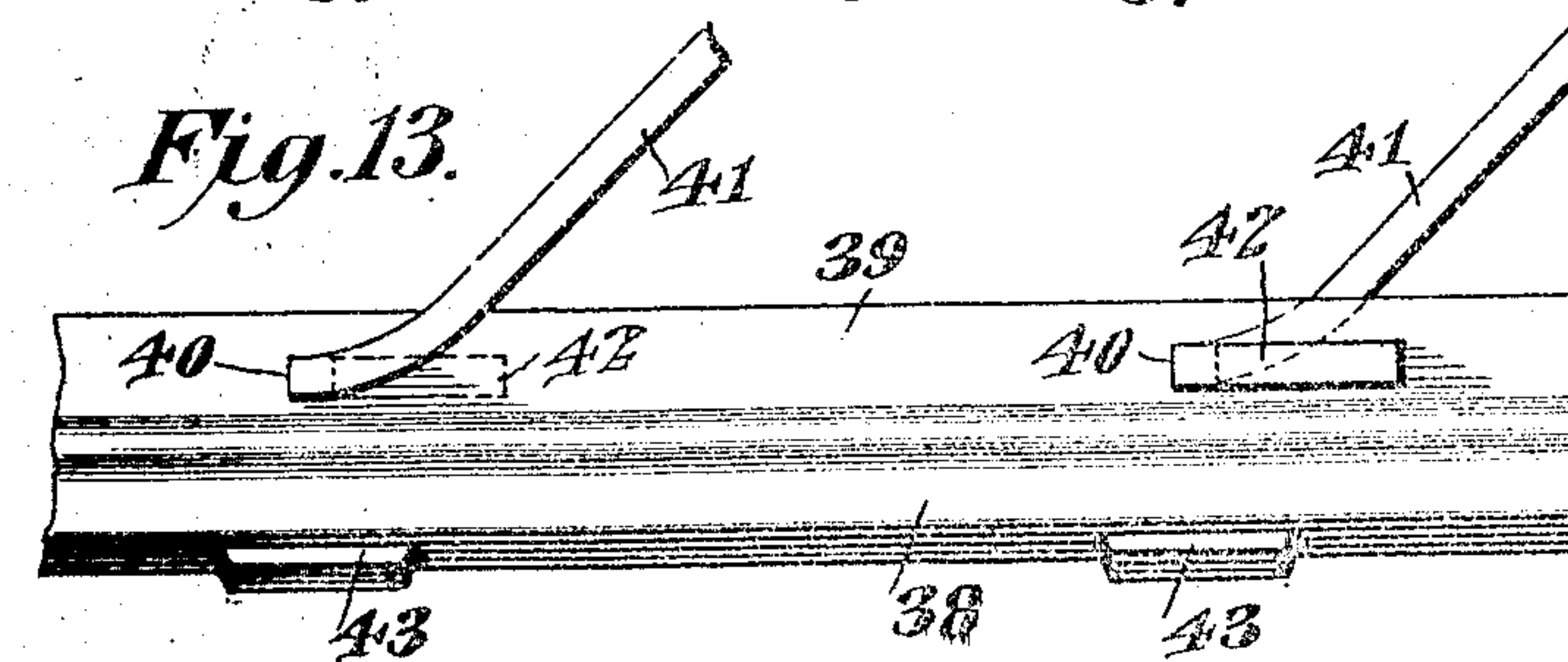
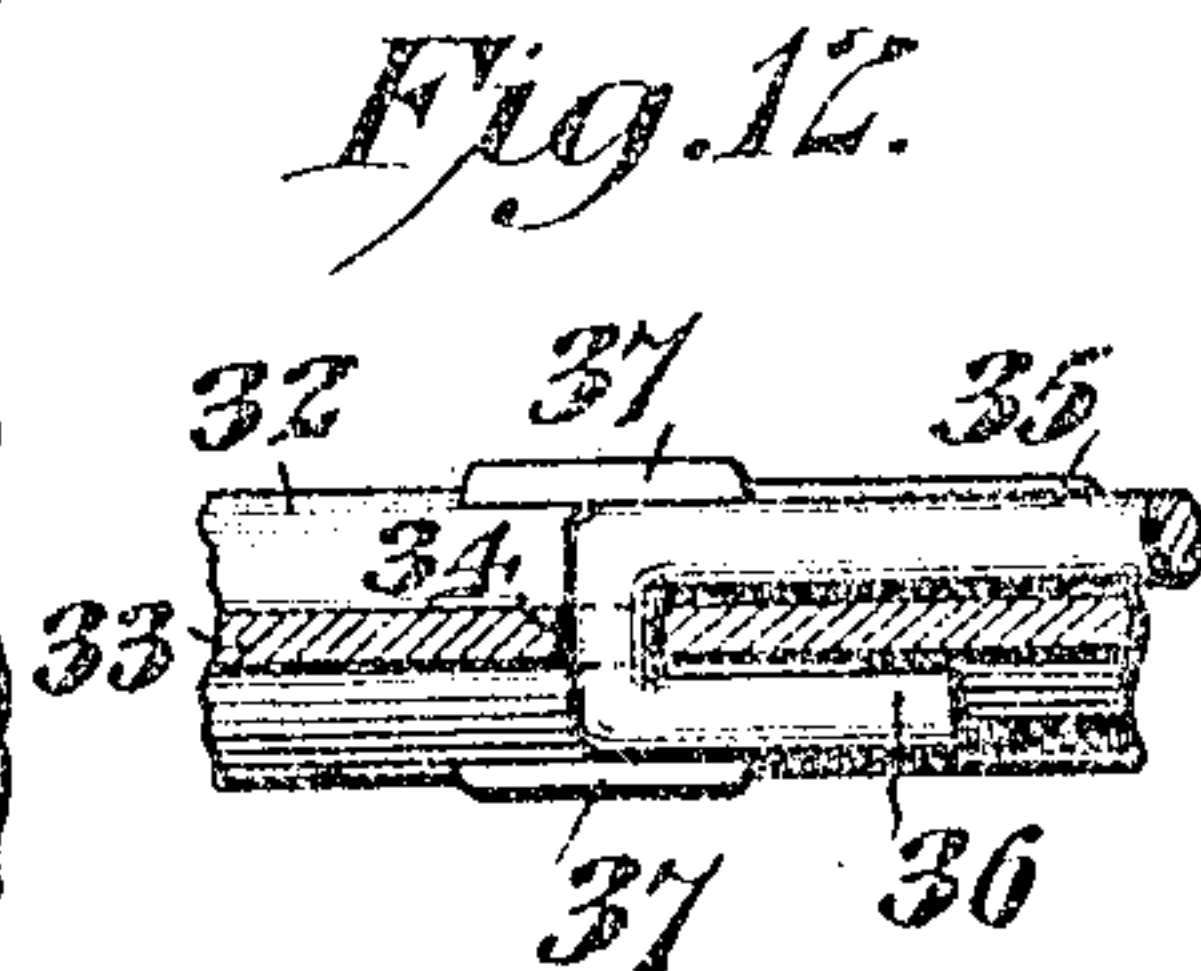
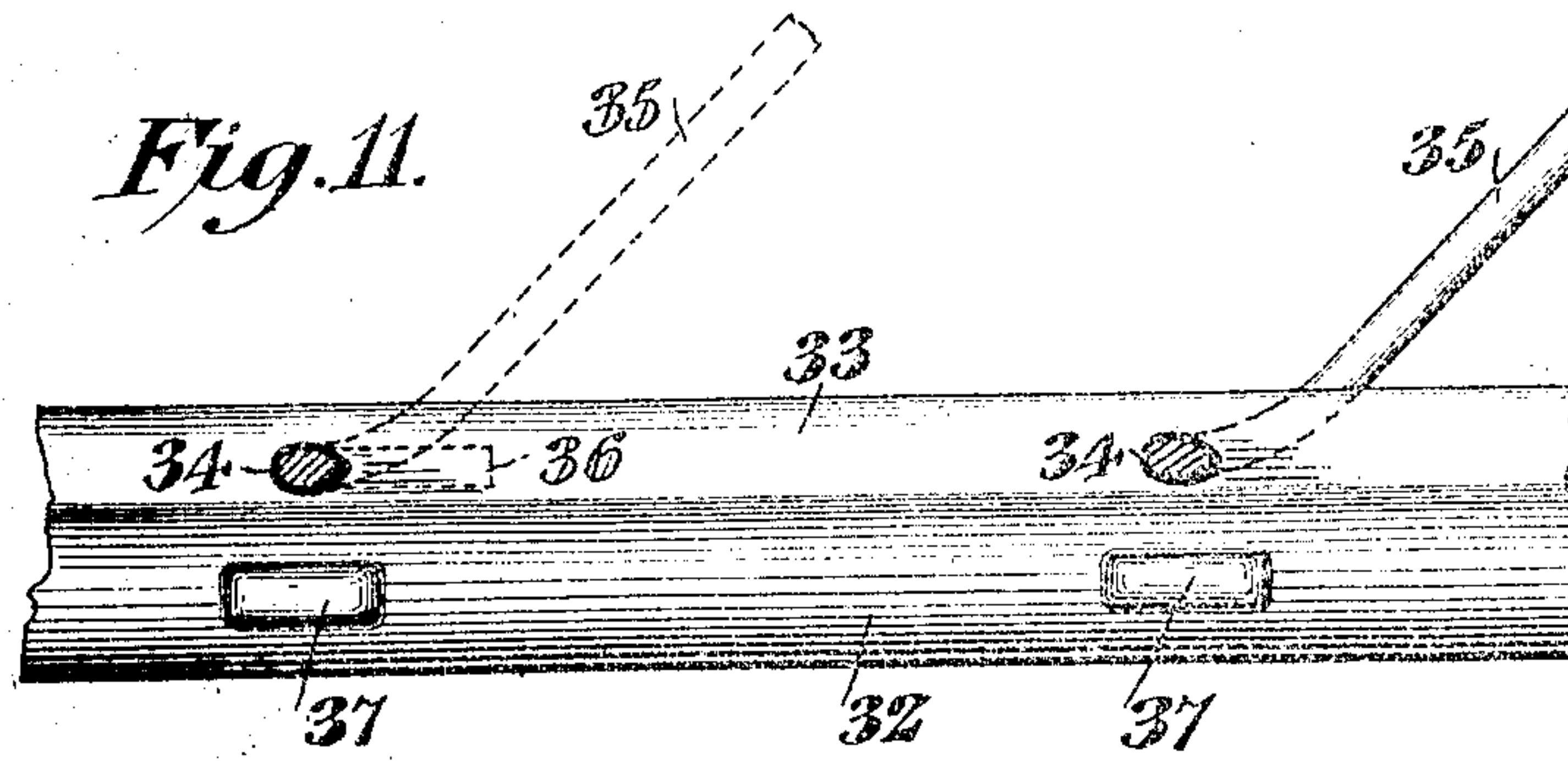
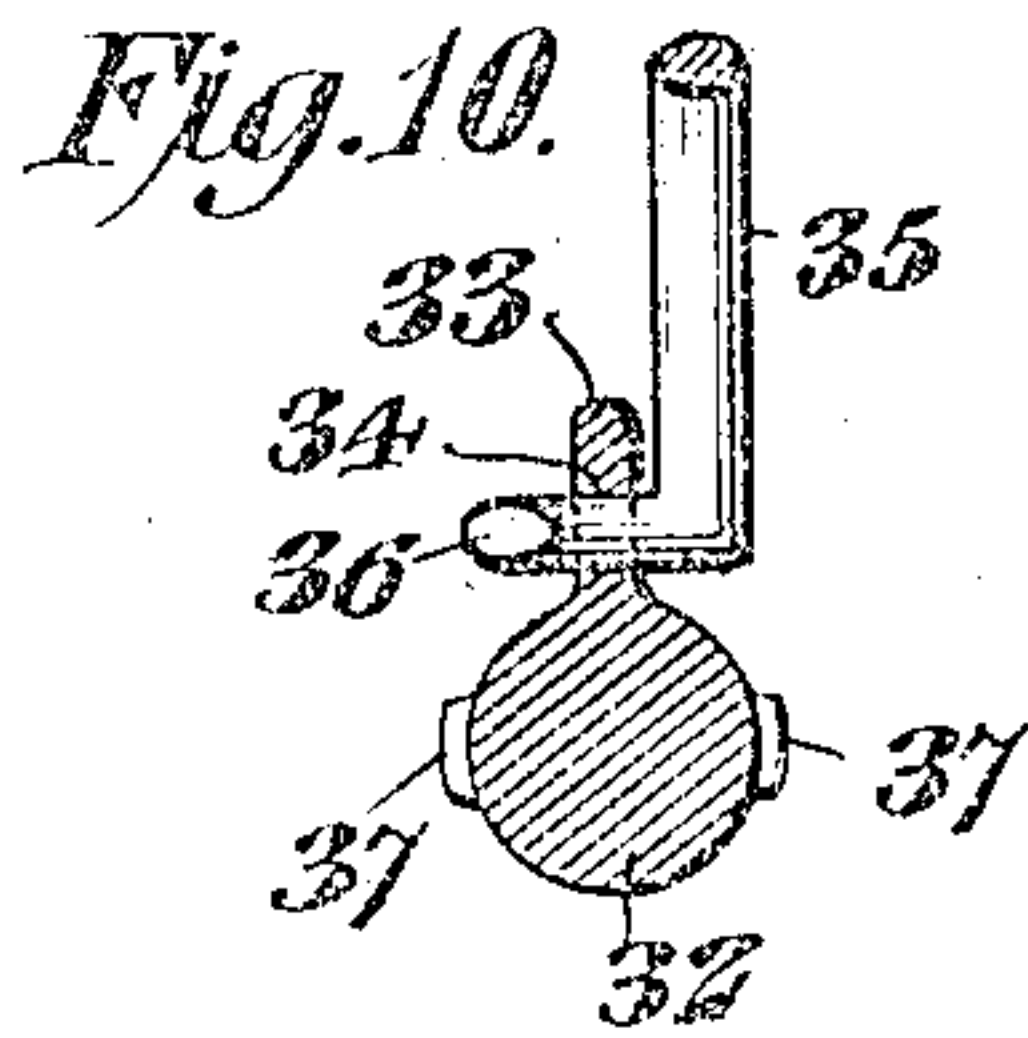
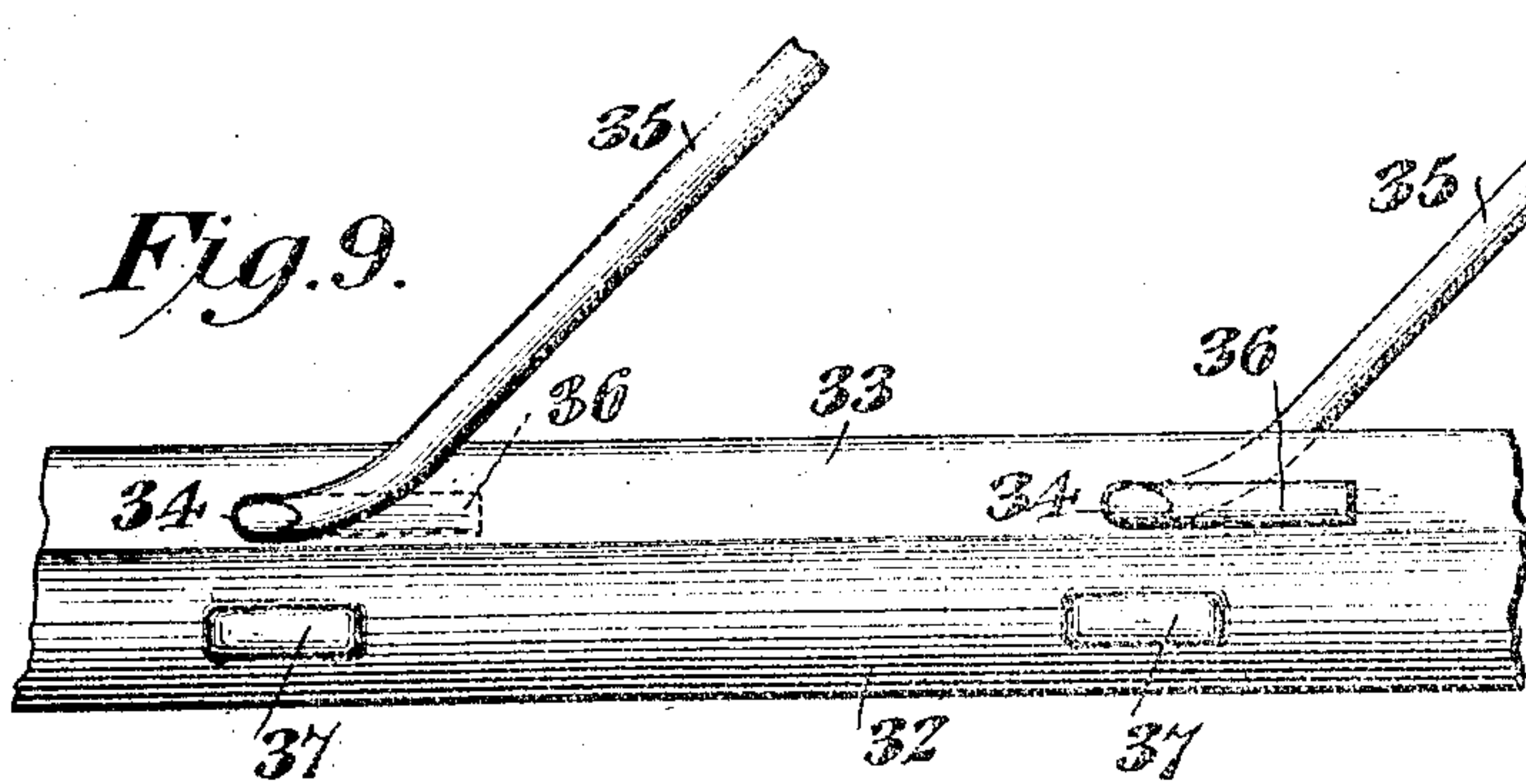
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# UNITED STATES PATENT OFFICE.

ELDRIDGE R. BOYLE AND WILLIAM B. UPTON, OF WASHINGTON, DISTRICT OF COLUMBIA.

## REINFORCING MEANS FOR CONCRETE STRUCTURES.

No. 925,989.

Specification of Letters Patent.

Patented June 22, 1909.

Application filed March 25, 1908. Serial No. 423,158.

*To all whom it may concern:*

Be it known that we, ELDRIDGE R. BOYLE and WILLIAM B. UPTON, citizens of the United States, residing at Washington, in the District of Columbia, have invented a new and useful Reinforcing Means for Concrete Structures, of which the following is a specification.

The primary object of this invention is to provide novel means of a simple nature, whereby an effective reinforcing structure for concrete is secured, in which the portions of the members weakened by openings formed therein, are reinforced, and said reinforcing members constitute anchors in the concrete.

While the invention is in the nature of an improvement on the means disclosed in the patent granted to us on September 3, 1907, No. 865,231, there are certain features that may perhaps be employed in other structures of an analogous character.

Another object is to provide a stress bar that can be easily rolled by the ordinary machinery, and when placed in position, the concrete can be effectively and readily packed about it.

In the drawings:—Figure 1 is a side elevation of a portion of a bar, and illustrating one embodiment of the invention. Fig. 2 is a cross sectional view therethrough. Fig. 2<sup>a</sup> is a detail sectional view that is diagrammatic in its character, illustrating the relative thickness of the lugs and fin. Fig. 3 is a side elevation, the reinforcing arms being shown in section. Fig. 4 is a horizontal sectional view. Fig. 5 is a side elevation of a different embodiment of the invention. Fig. 6 is a cross sectional view through the same. Fig. 7 is a side elevation, but showing the reinforcing arms in section. Fig. 8 is a horizontal sectional view. Fig. 9 is a side elevation of still another embodiment of the invention. Fig. 10 is a vertical sectional view therethrough. Fig. 11 is a side elevation, but showing the arms in section. Fig. 12 is a horizontal sectional view. Fig. 13 is a side elevation of a still different form of construction. Fig. 14 is a vertical cross sectional view through the same. Fig. 15 is a side elevation with the reinforcing arms illustrated in section. Fig. 16 is a horizontal sectional view.

Similar reference numerals designate corresponding parts in all the figures of the drawings.

Referring first to the embodiment dis-

closed in Figs. 1-4 inclusive, it will be noted that a stress bar 17 is employed comprising a body 18 hexangular in cross section and having a sectional upstanding longitudinally disposed fin 19 that projects from one of the edges or angles of said bar. This fin is provided at intervals with transverse openings 20 that are circular and receive the bowed portions 21 of substantially U-shaped reinforcing arms. These arms are formed of rods passing through said openings 20 and doubled, forming spaced members 22 located on opposite sides of the fin. Portions 23 of said members are offset, and rest upon the body 18 of the bar, thereby supporting said members 22 in upstanding angular relation to the bar, as shown.

In Fig. 11 of the drawings of our former patent is shown a modification, which was not claimed specifically and could not be so claimed in said patent for the specific claims were based on another form of the invention. It is our intention in the present application to claim this form, and the description thus far given applies equally well to the construction shown in Fig. 11 of the said patent, with the exception that a round bar is there shown while a hexagonal bar is herein described.

It will be evident that the formation of the openings 20 in the fin 19 weakens the stress bar 17 to some extent, and in order to overcome this weakness, sets of lugs 24 are provided on opposite sides of the body 18 in vertical alinement with the openings, but of considerably greater length than the same. In practice, each of these lugs is substantially half the thickness of the fin, and the cross section of a set of lugs located beneath one of the openings equals the cross section of such opening, as will be evident by reference to Fig. 2<sup>a</sup>. Consequently the amount of metal taken out of the bar by the formation of the openings is placed upon the body of the bar by the lugs, and as these lugs extend on opposite sides of the openings a considerable distance, the metal added to the bar is several times in excess of the amount taken from it by the formation of the openings. The location of the lugs directly beneath the openings and extending some distance beyond the opposite ends of the openings, is an important factor in enabling the bar to resist the strains to which it is subjected when in use. But furthermore because of their peculiar relation, they also perform another function, inasmuch as they



constitute anchors in the concrete. The particular shape of the bar is also important for not only can this bar be produced at comparatively small cost, but it is such that the concrete can be packed securely around and beneath it.

A different embodiment of the invention is illustrated in Figs. 5-8 inclusive. In this form of construction, the bar designated 10 25 corresponds in all respects with the bar 17, with the exception that the openings 26 through the fin 27 are angular. The body 28 of said bar is provided with sets of combined reinforcing and anchor lugs 29. The 15 reinforcing arms 30 are rods that are angular in cross section and are passed through the openings 26. In the present embodiment, the portions passed through the openings are bent horizontally, as shown at 31, so that 20 they lie alongside the fin, the angular rods or arms fitting in the angular openings, being thereby supported, inasmuch as they cannot rotate in said openings.

Still another form of construction is illustrated in Figs. 9-12 inclusive. In this embodiment the body 32 of the stress bar is circular in cross section, and has an upstanding central and longitudinally disposed fin, 33 that is provided with substantially oval or 30 elliptical openings 34. Reinforcing arms 35 corresponding to the same in cross section, are passed through these openings and have terminals 36 located alongside the fin. Sets of reinforcing anchor lugs 37 are provided on 35 opposite sides of the body and correspond in all respects to those first described. In Figs. 13-16 still another embodiment of the invention is disclosed. In this form of construction, the body 38 of the bar is hexangular 40 in cross section, and has an upstanding longitudinal disposed fin 39 that is provided with angular openings 40. Reinforcing arms 41 are passed through the openings and have terminals 42 located alongside the fin. In 45 this structure, the lugs, instead of being on the opposite sides are on the bottom, as illustrated at 43, the opposite portions of said lugs being angularly disposed as will be clear by reference to Fig. 14. Practically the 50 same results are secured in this form of construction as in the other, inasmuch as said lugs not only compensate for the metal eliminated by the openings, but also act as anchors. The preferred form of stress bar is 55 shown in Figs. 1 to 8, inclusive, in which the bar is made hexangular in cross section with the longitudinal fin upstanding from one of the angles. This brings the lugs 29, which are located on the opposite flat faces of the 60 bar, in a substantially vertical position, and being spaced apart on the bar, they firmly engage the body of concrete which is packed about the bar.

From the foregoing, it is thought that the 65 construction, operation and many advan-

tages of the herein described invention will be apparent to those skilled in the art, without further description, and it will be understood that various changes in the size, shape, proportion, and minor details of construction, 70 may be resorted to without departing from the spirit or sacrificing any of the advantages of the invention.

Having thus fully described our invention, what we claim as new, and desire to secure 75 by Letters Patent is:—

1. In a structure of the character set forth, the combination with a bar comprising a body having a fin, of a reinforcing arm having one portion engaged with the fin, another portion disposed longitudinally of and 80 resting against the body at one side of the fin, and a third portion disposed in angular relation to the second portion and supported thereby in angular relation to the body. 85

2. In a structure of the character set forth, the combination with a bar comprising a body having a fin, said fin being provided with an opening, of a reinforcing arm engaged in the opening and having angularly 90 disposed portions, one of which rests against the body, the other being thereby supported in angular relation to the body.

3. In a structure of the character set forth, the combination with a bar comprising a 95 body having a fin, said fin being provided with an opening, of a reinforcing arm passed through the said opening, then carried in substantial parallelism with the body and resting against the latter, and finally bent up at 100 an angle thereto.

4. In a structure of the character set forth, the combination with a bar comprising a body having an upstanding longitudinally 105 disposed fin, said fin being provided with a substantially circular opening, of a reinforcing arm comprising a rod that passes through the opening and is bent into substantially U-shape, forming spaced members located 110 on opposite sides of the fin, said members each comprising angularly disposed portions, one of which rests against and is disposed longitudinally of the body of the bar, the other portion being thereby supported in angular relation to the bar. 115

5. In a structure of the character set forth, a stress bar having a body that is hexagonal in cross section and is provided with a single central longitudinal outstanding fin at one of 120 its angles, said fin being of less thickness than the body and provided with perforations to receive reinforcing arms, the two opposite faces of the body being provided with lugs projecting from said faces in spaced relation and in alignment with the perforations and 125 in compensation therefor to maintain the cross sectional area and tensile strength of the bar.

6. In a structure of the character set forth, the combination with a bar comprising a 130



body having a longitudinally-disposed out-  
standing fin of less thickness than the body  
and provided with openings, of reinforcing  
arms engaged in the openings, and spaced  
5 combined reinforcing and anchor lugs lo-  
cated longitudinally upon the bar, each lug  
being in alinement with one of the openings,  
there being at least as many lugs as there are  
openings, said lugs being in compensation  
10 for the openings to maintain the cross-sec-  
tional area and tensile strength of the bar.

7. In a structure of the character set forth,  
the combination with a bar comprising a  
body having a longitudinally disposed fin of  
15 less diameter than the body and provided  
with openings, of reinforcing arms engaged  
in the openings, and spaced elongated com-  
bined reinforcing and anchor lugs located  
longitudinally upon the bar in alinement  
20 with the openings and of greater length than  
the same and extending beyond each end of  
the openings.

8. In a structure of the character set forth,  
a bar comprising a body having a fin of less  
25 diameter than the body and provided with  
transverse openings, and combined reinforce-  
ing and anchor lugs located at intervals along  
the body, each of the lugs being disposed in  
alinement with one of the openings and of  
30 greater length than the same, said lugs being  
arranged in sets on opposite sides of the body,  
the combined area of each set being greater  
than the area of any one of the openings.

9 In a structure of the character set forth,  
35 a bar comprising a body having an upstand-  
ing fin of less diameter than the body and  
provided with transverse openings to re-  
ceive reinforcing arms, and sets of spaced  
combined reinforcing and anchor lugs lo-  
cated at intervals along the body on opposite  
sides thereof, each lug being in vertical aline-

ment with one of the openings and of greater  
length than the same and extending beyond  
each end of the openings.

10. In a structure of the character set 45  
forth, a stress bar comprising a body having  
an outstanding longitudinal fin extending  
centrally of the body and provided with  
transverse openings at intervals, and corre-  
sponding sets of spaced lugs located along 50  
the opposite sides of the body, each set of  
lugs being in alinement with one of the open-  
ings and of greater length than the same, the  
combined cross section of each set being sub-  
stantially equal to the cross section of the 55  
transverse opening formed in the fin, while  
the combined area of each set is greater than  
the area of the opening.

11. In a structure of the character set  
forth, the combination with a bar compris- 60  
ing a body that is substantially hexangular  
in cross section, and a longitudinally dis-  
posed fin projecting centrally from one of  
the edges of the body, said fin being pro-  
vided at intervals with transverse openings, 65  
of reinforcing arms having portions located  
in the openings and disposed upwardly in  
angular relation to the bar, and sets of spaced  
lugs formed upon the opposite sides of the  
body in alinement with the openings and 70  
longer than said openings, the combined  
cross section of each set of lugs being sub-  
stantially the cross section of the opening of  
the fin.

In testimony, that we claim the foregoing 75  
as our own, we have hereto affixed our signa-  
tures in the presence of two witnesses.

ELDRIDGE R. BOYLE.  
WILLIAM B. UPTON.

Witnesses:

JOHN H. SIGGERS.  
E. G. SIGGERS.