

Sept. 1, 1931.

T. MENSFORTH
FOOT ATTACHMENT FOR PIT PROPS OR STEEL ARCHES
EMPLOYED AS COLLIERY OR MINING ROOF SUPPORTS
Filed July 8, 1930

1,821,020

4 Sheets-Sheet 1

FIG. 2.

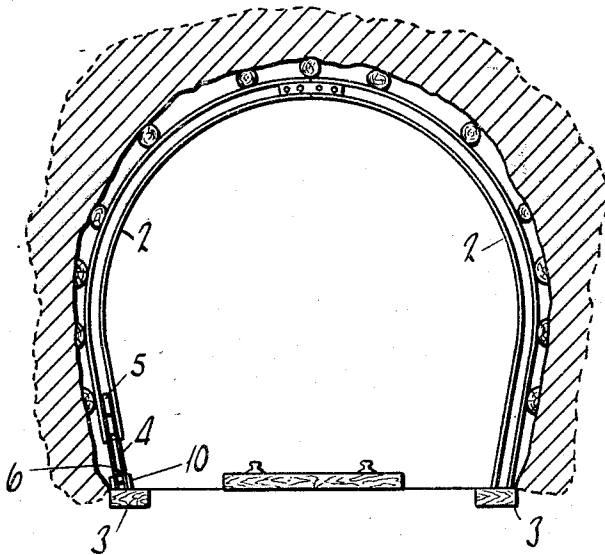


FIG. 1.

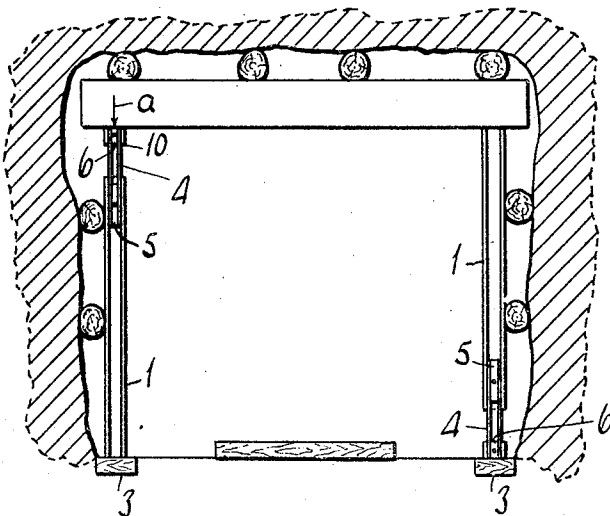


FIG. 5.

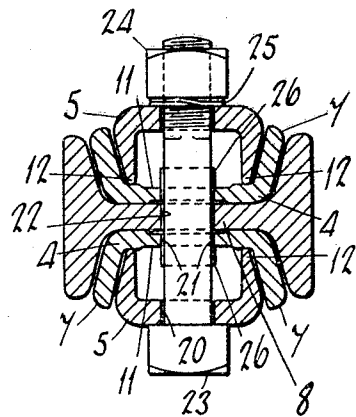
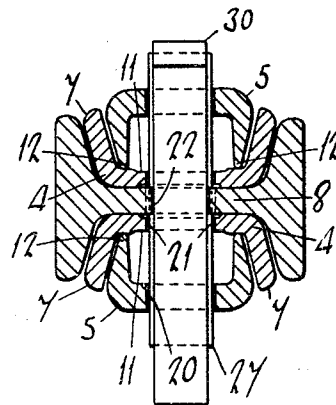


FIG. 8.



INVENTOR
THOMAS MENSFORTH
By *John F. Schuchman*
ATTORNEY

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4 Sheets-Sheet 2

FIG. 3.

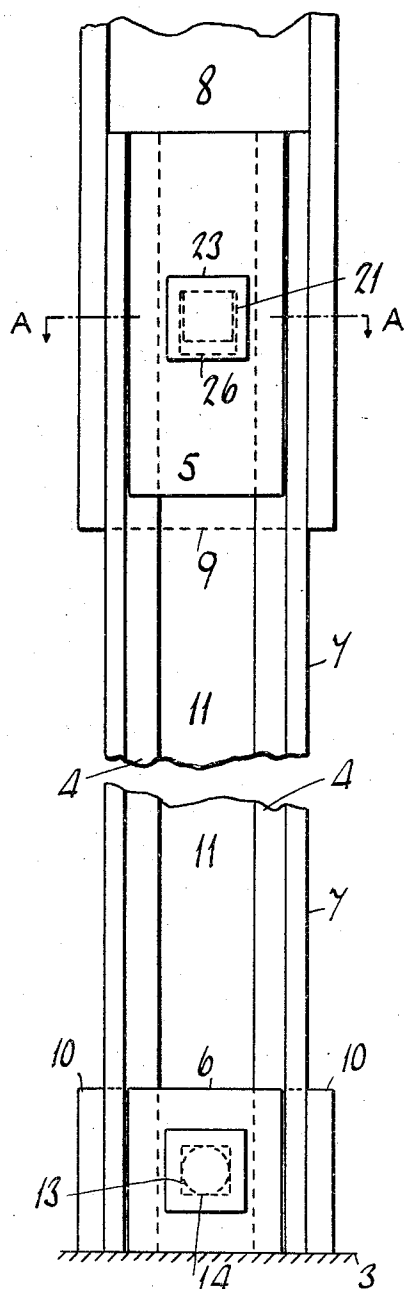
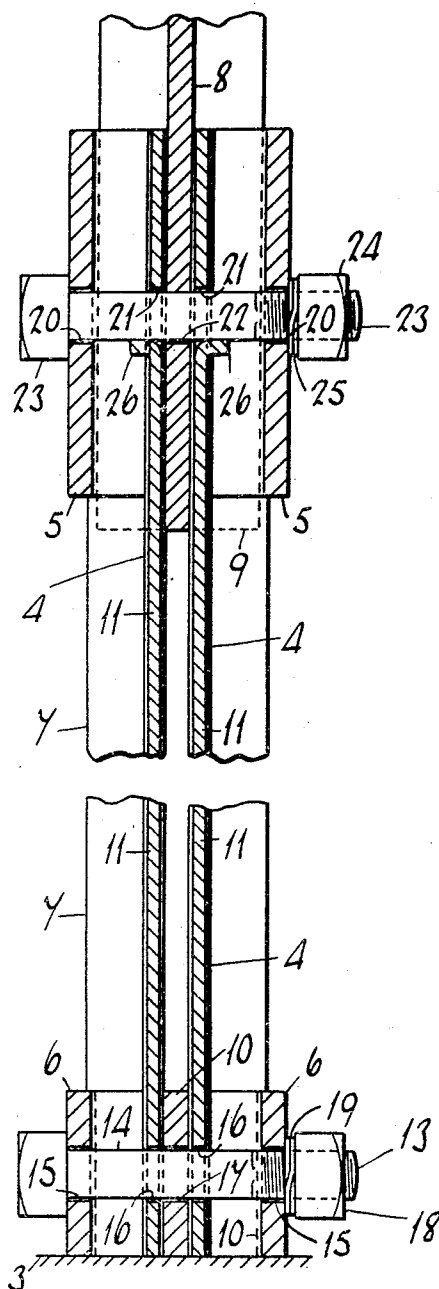


FIG. 4.



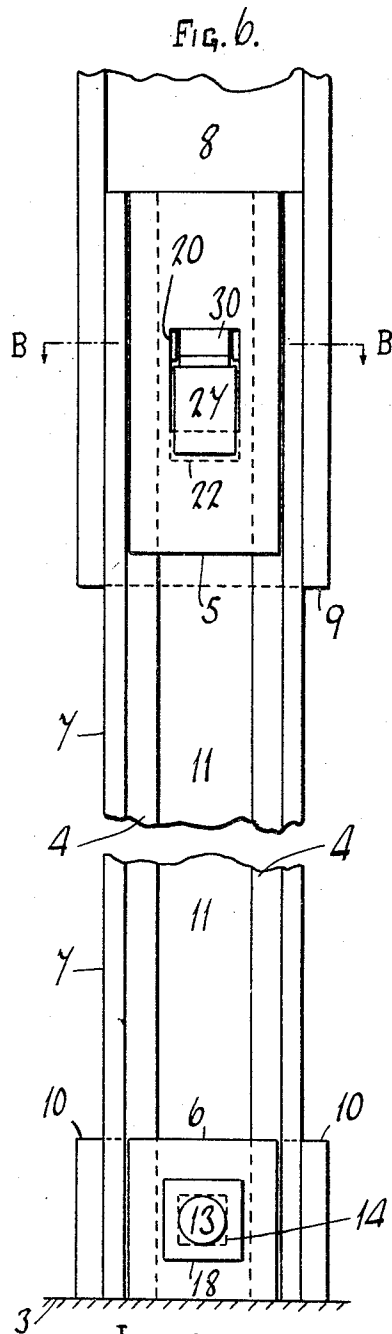
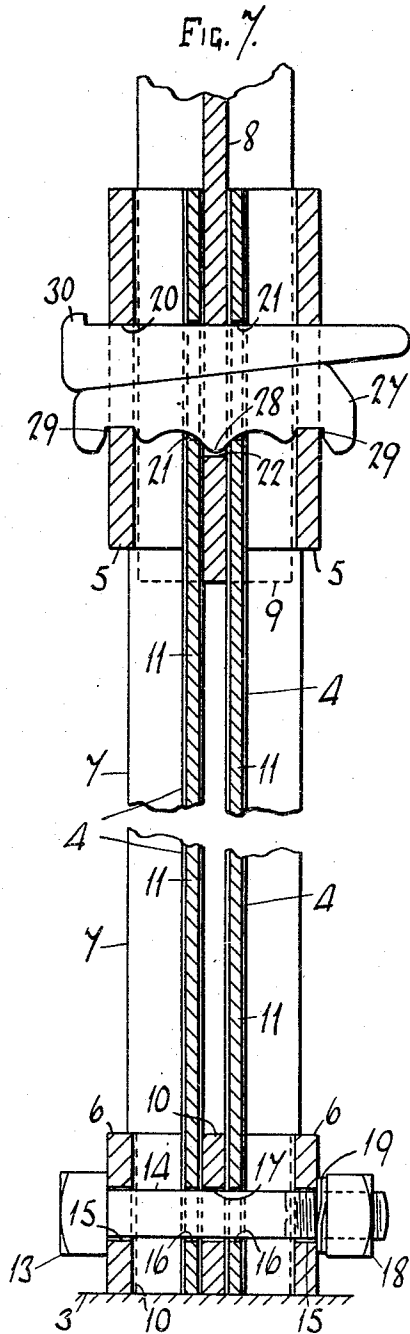
INVENTOR
THOMAS MENSFORTH
By *J. M. Ketchum*
ATTORNEY

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4 Sheets-Sheet 3



INVENTOR
THOMAS MENSFORTH
By *J. M. Fletcher* *stonchough*
ATTORNEY

Sept. 1, 1931.

T. MENSFORTH

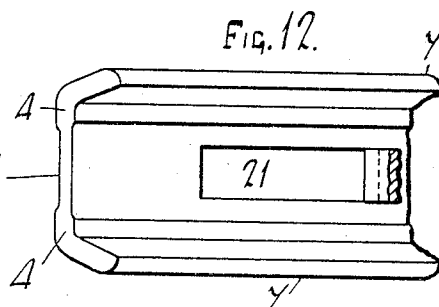
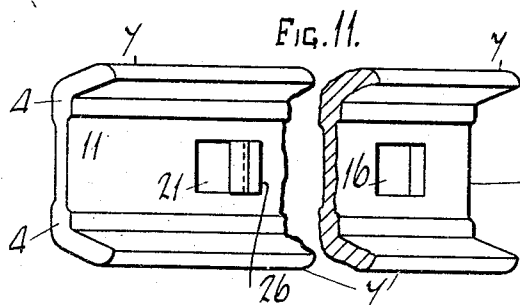
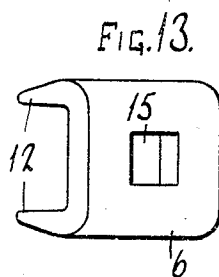
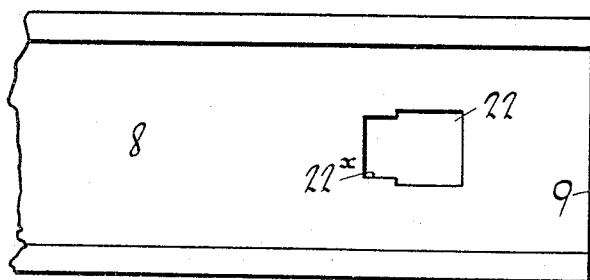
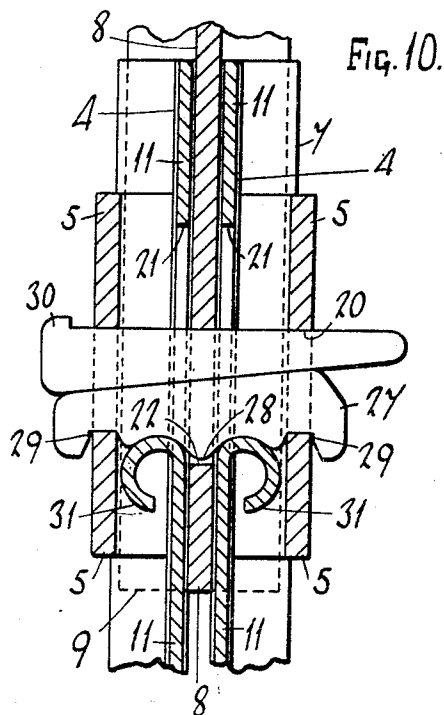
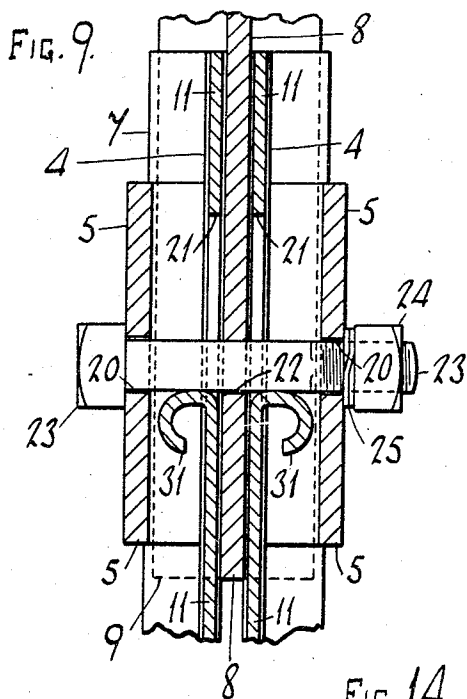
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FOOT ATTACHMENT FOR PIT PROPS OR STEEL ARCHES

EMPLOYED AS COLLIERY OR MINING ROOF SUPPORTS

Filed July 8, 1930

4 Sheets-Sheet 4



INVENTOR
THOMAS MENSFORTH
J. E. M. Fetherstonhaugh
ATTORNEY

UNITED STATES PATENT OFFICE

THOMAS MENSFORTH, OF MIDDLETON ST. GEORGE, ENGLAND

FOOT ATTACHMENT FOR PIT PROPS OR STEEL ARCHES EMPLOYED AS COLLIERY OR MINING ROOF SUPPORTS

Application filed July 8, 1930, Serial No. 466,395, and in Great Britain June 17, 1929.

This invention relates to steel pit props of straight or arch formation employed for temporarily or permanently supporting the roof during mining and colliery operations.

It is customary when steel arches are used to place wood baulks between the arches and the overlying material so as to distribute the pressure of the roof and walls evenly on the steel arch. When a straight steel prop is used the usual crown tree is employed.

Hitherto it has been found after the steel props or supports have been set, a certain amount of settlement of earth takes place, thereby applying to the supports intense pressure which is very difficult to resist, and causes the supports, in many cases, to freely yield or become distorted or broken. The usual practice is, after a certain amount of settlement has taken place, to remove the supports and reset them, thereby relieving the stress to which they have been subjected. It has frequently been found that the operation of re-setting requires to be repeated owing to a number of settlements of the overlying material taking place, after which the said material binds itself together and the roof then remains stable for a considerable period.

Where timber props have been employed they have frequently been pointed at one end in such a manner that they have been weakened at the said ends so that they can yield to the applied pressure, thereby preventing the props from being overloaded and fractured.

In this invention provision is made for dispensing with the above named re-setting operations and the expense attendant thereon, by providing an end attachment for the leg or legs of the pit prop or steel arch, whereby the prop or arch automatically adjusts itself to the pressure applied thereto by means of a shearing action.

In carrying this invention into practice the straight prop or arch is made of steel and of H-section as is usually done, and the arch is made of horse shoe or other desired shape in one or more portions. When made in two or more portions they may be secured together by fish plates and bolts. When in arch

form one or both legs of the arch is or are made shorter in length than hitherto to provide a space for the insertion of the herein-after described end attachment between the top of the "road" or wood or other sleeper,—that is usually placed longitudinally thereon,—and the lower end or ends of the said leg or legs.

When this invention is employed in combination with an ordinary steel prop the latter is made shorter in length than hitherto to allow for the end attachment to be secured to one end of the prop.

Each attachment may consist of six portions, namely, two channel sections,—hereinafter termed "shearing members",—and four cover or clamping plates which are arranged so that the two shearing members,—with their flanges turned in an outward direction,—fit on each side of the web of the H-section steel arch or prop and between its flanges as hereinafter described.

In the drawings hereunto annexed the end attachment is shown applied to the ends of steel props and to the ends of steel arches.

Fig. 1 is an elevation showing the attachment applied alternatively to the upper and lower ends of the steel props;

Fig. 2 is an elevation showing the attachment applied to one leg of a steel arch;

Fig. 3 is an elevation of the said attachment;

Fig. 4 a sectional elevation drawn at a right angle to Fig. 3;

Fig. 5 a sectional plan on line A, A, Fig. 3;

Fig. 6 an elevation of a modified arrangement of the means for securing the attachment to the end of a straight prop or steel arch;

Fig. 7 a sectional elevation drawn at a right angle to Fig. 6;

Fig. 8 a sectional plan on line B, B, Fig. 6;

Fig. 9 a sectional elevation corresponding to Fig. 4 showing the attachment after the shearing action has taken place;

Fig. 10 a sectional elevation of the attachment illustrated in Fig. 7 after the shearing action has taken place;

Fig. 11 an elevation of the shearing member as shown in Fig. 3;

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Fig. 12 an elevation of same member after the shearing action has taken place;

Fig. 13 an elevation of a short cover plate;

Fig. 14 an elevation of the end of a straight prop or a steel arch for the reception of the securing means shown in Figs. 6 to 8.

Figs. 3 to 14 inclusive are drawn to a larger scale than Figs. 1 and 2.

Like parts in all the views are marked with corresponding reference numerals.

The straight prop 1 or arch 2 is made of steel and of H-section as is usually done. The arch 2 is made of a horse shoe or other desired shape in one or more portions which are secured together by fish plates and bolts, as shown at Fig. 2. When the arch 2 is used one or both of its legs is or are made shorter in length than usual to provide a space for the insertion of the hereinafter described end attachment between the top of the "road" or wood or other sleeper 3,—that is usually placed longitudinally thereon,—and the lower end or ends of the said leg or legs.

The attachment consists of six portions, namely, two channel sections—hereinafter termed "shearing members" 4, 4,—and four cover or clamping plates marked respectively 5, 5, and 6, 6, which are so arranged that the two shearing members 4, 4,—with their flanges 7, 7, turned in an outward direction,—fit on each side of web 8 of the H-section of the steel prop 1 or of the arch 2 and between its flanges. The shearing members 4, 4, are made of such a length that they will bridge and overlap the gap between the end 9 of the straight prop 1 or of the leg of the arch 2 and a short piece of H-section steel 10 that rests upon the said wood or other sleeper 3 or abuts against the point of application of the load indicated by the arrow marked *a* Fig. 1. The shearing members 4, 4, are made U-shaped, as shown at Figs. 5, 8, 11 and 12, and recessed in the web portion so that the thin web 11 thus formed will easily tear under pressure, as will be presently described. It will be found that if the web 11 is made seven-thirty seconds of an inch in thickness satisfactory results will be obtained, but it should be distinctly understood that it is not limited to the said size, which may vary as circumstances require. The cover plates 5, 5, and 6, 6, are each made of a U-shaped section,—as shown at Figs. 5, 8, and 13,—adapted to fit between the flanges 7, 7, of the shearing members 4, 4, so that the longitudinal edges of each of the projecting portions 12, 12 of the plates abut against a suitable thickened portion of the web of a shearing member 4. The cover plates 6, 6, are preferably made shorter,—but not necessarily so,—in length than the other two plates 5, 5, and the plates 6, 6, are arranged one on each side of the short piece of H-section steel 10, the end of which abuts against the point *a* of application of the load, or

rests upon the wood or other sleeper 3. The cover plates 6, 6, shearing members 4, 4, and short piece of H-section steel 10 are secured together by a case hardened bolt 13 provided with a square shank 14,—for a portion of its length,—which passes through square holes 15, 16, 17,—as shown at Figs. 4 and 7,—formed for its reception in the said parts, a nut 18 and spring washer 19 being provided for securing purposes. The upper or longer cover plates 5, 5, the upper end of the shearing member 4, 4, and the end 9 of the straight prop 1 or the arch 2 are respectively provided with the holes 20, 21 and 22 through which is passed a case hardened bolt 23,—having a nut 24 and spring washer 25 mounted thereon,—for securing the upper ends of the channel members 4, 4, to the lower end 9 of the leg of the steel arch 2 or straight prop 1. The square holes 21 former in the thin webs 11 of the channel members 4, 4, for the reception of the top bolt 23 are each provided with an outwardly projecting lip 26 on its lower edge for enabling a start to be given to the shearing operation when pressure is applied to the steel arch 2 or the straight prop 1.

In the modified securing means for the end attachment shown at Figs. 6, 7, 8 and 10, the long cover plates 5, 5, and the upper ends of the shearing members 4, 4, are secured to the end 9 of the straight prop 1 or the steel arch 2 by means of a metal gib or a piece of hard steel,—hereafter termed a "cross piece" 27,—which is approximately rectangular in cross section, and takes the place of the bolt 23. One edge of the cross piece 27 is inclined from end to end and the opposite edge is provided with a V or other shaped projection 28, at or about its centre, which is either pointed or rounded,—as shown at Figs. 7 and 10,—or otherwise shaped at the juncture of the two sides. Each of the said sides is arranged respectively to form a tangent to an arc,—as shown at Fig. 7,—the outer end of which terminates at a transverse recess 29, 29 formed at a suitable distance from the end of the cross piece. The transverse recesses 29, 29 in the cross piece 27 are arranged at the same distance apart as are the webs of the cover plates 5, 5. A headed gib or wedge 30 is arranged to be placed upon the inclined edge of the cross piece 27, and when so placed and driven tightly into position the cross piece 27 will secure the cover plates 5, 5, shearing members 4, 4, and end 9 of the straight prop 1 or the arch 2 together.

In the web of each larger cover plate 5,—as shown at Fig. 6,—the rectangular hole 20 is formed of such a size that the end of the cross piece 27 can pass through it; a portion of the said web in which the hole 20 is formed can then enter the recess 29. The hole 20 is also made of such a size that the gib or wedge 30 can subsequently pass

through it for locking the cover plates 5, 5, in position. The holes 21, 21 and 22 are also formed of suitable size in the webs of the shearing members 4, 4, and in the end 9 in order to permit of the gib or wedge 30 and cross piece 27 passing through them. The hole 22 in the end 9 is made as shown at Fig. 14 when a gib or wedge 30 and cross piece 27 is employed, that is to say, the cross piece is placed in the widest portion of the hole 22, and the gib or wedge 30 in the narrowest portion 22a of the said hole. This arrangement prevents the parts 27 and 30 being wrongly inserted. This type of securing means allows the lip 26, Fig. 4, to be dispensed with.

The cover plates and shearing members are assembled together and attached to the end of a pit prop or an arch in the following manner, namely:—

The ends of the two shearing members 4, 4, and short cover plates 6, 6, are rigidly fixed by the bolt 13 and nut 18 to the short piece of H-section steel 10, which is of the same contour in cross section as the end of the pit prop 1 or arch 2. The opposite ends of the shearing members 4, 4, are secured by the bolt 23, nut 24, and washer 25, or by the cross piece 27 and wedge 30 to an end of the pit prop 1, or of the arch 2. The just named opposite end of each shearing member 4 is placed on each side of the web 8 and between the flanges of the end 9 with the flat portion or web of each shearing member 4 in contact with the central web 8 of the said end. Between the flanges 7, 7, of each of the shearing members 4, 4, is placed one of the larger covering plates 5 with its flanges 12, 12 in contact with the web of the said members, as shown at Figs. 5 and 8. The last named cover plates 5, 5, are secured to the end 9 and also to the shearing members 4, 4, by the bolt 23 and nut 24, or by the cross piece 27 and wedge 30 so that both of the cover plates 5, 5, prop 1, or arch 2 and the securing means are capable of sliding whenever pressure is placed upon a prop 1 or an arch 2.

When the said pressure is applied by the settlement of the overlying material the leg of the steel arch 2 or prop 1 moves in, say, a downward direction towards the small piece of H-section steel 10, thus carrying the upper case hardened bolt 23, nut 24 and washer 25, or the wedge 30 and cross piece 27 with it, thereby tearing the thin webs 11 of the shearing members 4, 4. This tearing action continues until the settlement of the earth ceases or the leg abuts against the upper end of the short piece of H-section steel 10. During the just named movement the two upper or long cover plates 5, 5, slide upon the thick portion of the web of the shearing member 4, 4. During the just named shearing action a narrow strip 31,—Figs. 9 and 10,—is torn from the thin web 11 by the downward movement of the bolt 23 or cross piece 27.

When it is desired to remove the arch or prop whilst the load is upon it, all that is necessary when a cross piece 27 and wedge 30 are employed, is to knock back with a hammer or other tool the projecting end of the gib or wedge 30, thus relieving the pressure on the arch 2 or prop 1.

What I claim is:—

1. An end attachment for the leg portion of steel props and arches used as supports for the roofs of collieries and mines, each attachment being composed of a plurality of portions, namely, a pair of flanged U-shaped shearing members and four U-shaped clamping plates, the said plates being arranged in pairs at the ends of the shearing members which are afterwards attached respectively to the prop and to a footpiece formed of steel, the shearing members bridging and overlapping a gap between the end of the prop and the footpiece.

2. An end attachment for use in connection with the legs of props and arches employed for supporting roofs in collieries and mines having a pair of shearing members adapted to be fixed on each side of the end of a prop, each member being formed U-shaped in cross section and provided with a thin longitudinal central web portion having an opening therein for enabling the web to be torn on undue pressure being applied to the prop, a clamping plate arranged at each end of a shearing member, and means for securing the shearing members and their clamping plates respectively to the end of a prop and to a footpiece as set forth.

3. An end attachment for use in connection with the legs of props and arches employed for supporting roofs in collieries and mines having a pair of U-shaped shearing members, each member being provided with a thin longitudinal central web having an opening therein with a lip for enabling the web to be torn on undue pressure being applied, a pair of U-shaped clamping plates arranged at each end of the shearing members and between the flanges thereof, the ends of the shearing members being afterwards respectively fitted between the flanges of, and arranged to abut against, the webs of the end of a pit prop and a footpiece of H-section steel, the shearing members and the clamping plates being secured in position by bolts which pass transversely through openings in the said parts, the upper bolt being arranged to tear the said thin longitudinal central web on undue pressure being applied to the prop as set forth.

4. An end attachment for use in connection with the legs of props and arches employed for supporting roofs in collieries and mines having a pair of U-shaped shearing members, each member being provided with a thin longitudinal central web having an opening therein for enabling the web to be torn on

undue pressure being applied, a pair of U-shaped clamping plates arranged at each end of the shearing members and between the flanges thereof, the ends of the shearing members being afterwards respectively fitted between the flanges of, and arranged to abut against, the webs of the end of a pit prop and a footpiece of H-section steel, the shearing members and the clamping plates being secured in position by a bolt, a cross piece and a wedge which pass transversely through openings in the said parts, the cross piece being arranged to tear the said thin longitudinal central web on undue pressure being applied to the prop as set forth.

THOMAS MENSFORTH.

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