

Nov. 17, 1931.

A. J. PENOTE .

1,832,787

EXTENSION BOOM FOR EXCAVATORS

Filed Jan. 25, 1929

3 Sheets-Sheet 1

FIG. 1.

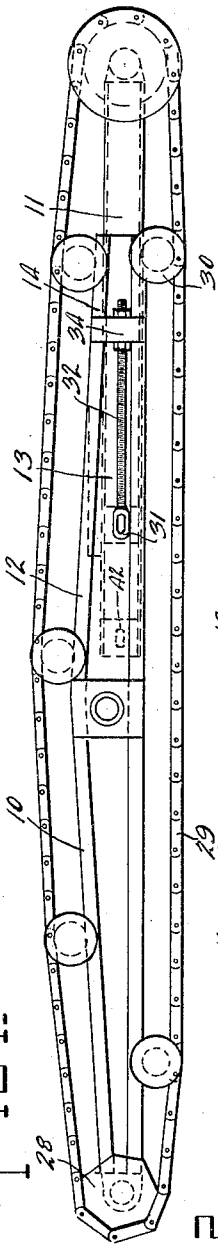


FIG. 2.

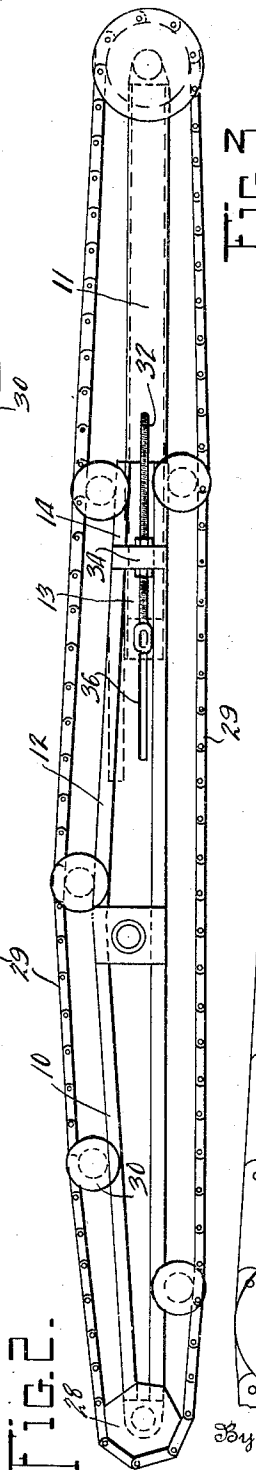
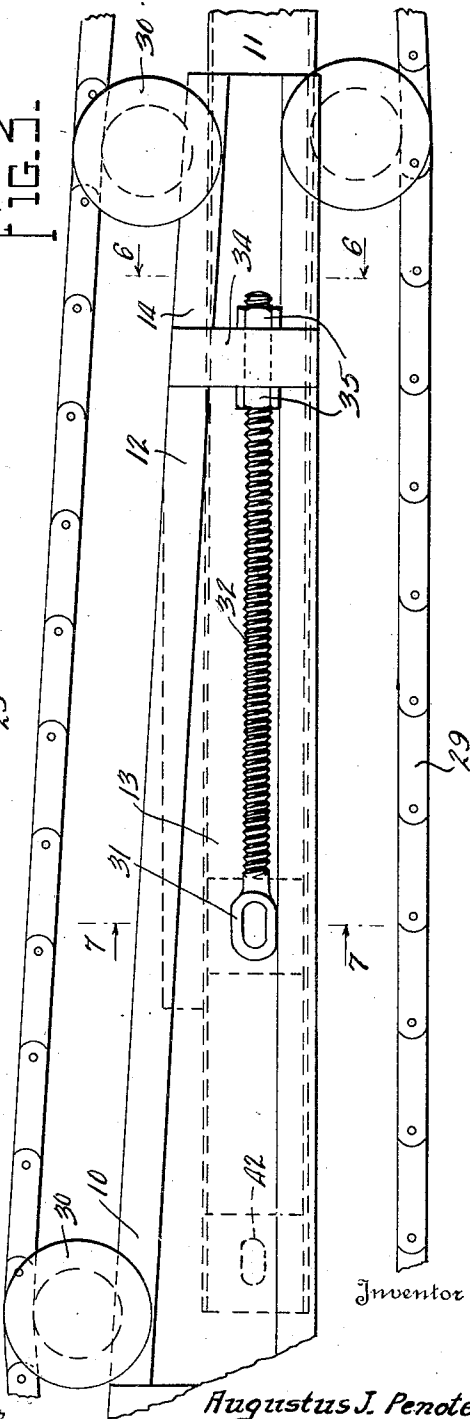


FIG. 3.



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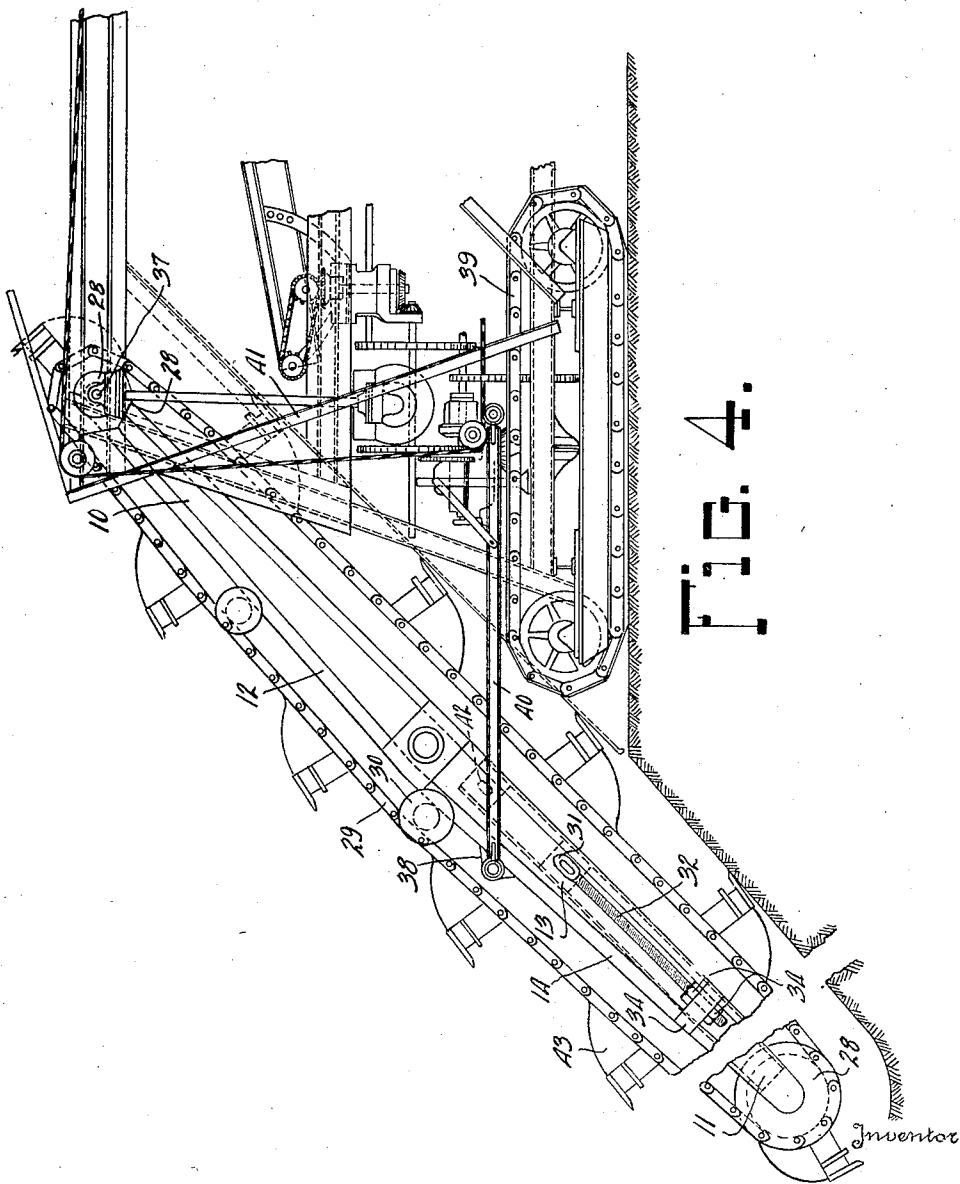


Fig. 4.

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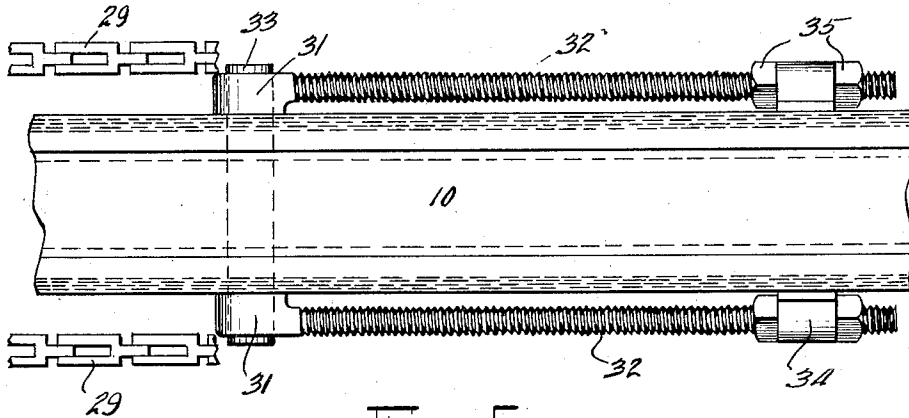


FIG. 5.

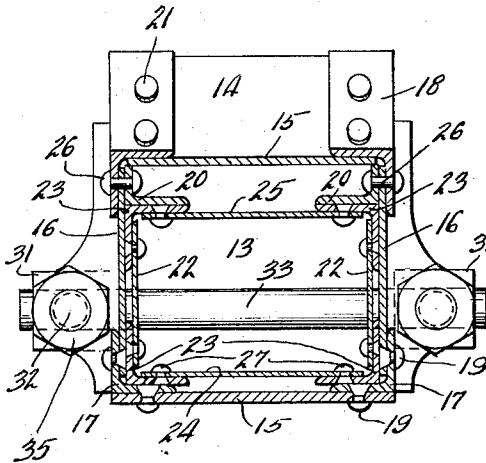


FIG. 6.

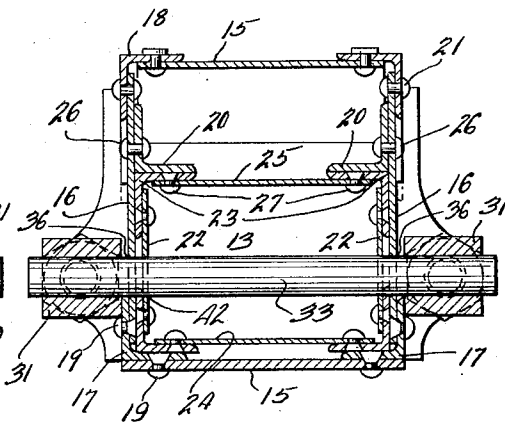


FIG. 7.

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EXTENSION BOOM FOR EXCAVATORS

Application filed January 25, 1929. Serial No. 334,971.

My invention relates to extension booms for excavators especially adapted to the digging of trenches; and the particular object thereof is to provide a simple and convenient machine including therein the so-called endless chain digger whose chain or endless carrier will support thereon a series of spaced scoops or buckets adapted to carry dirt or any other mineral matter upwardly on one side and return them empty to the lower end of the chain to be again filled for propulsion as before.

The present invention relates particularly, to the improvement in the manner I have discovered in adjusting the length of the endless carrier, and therefore, of a practicable and efficient means of adjusting the length of the support or boom upon which the endless chain or carrier is supported. Generally stated, the object of my invention is to provide an adjustable mechanism for the said boom which will retain a suitably strong support or boom at varying positions of the boom and at varying lengths of the same.

A further object of my invention is to provide an adjustable boom for an endless digging chain or carrier designed to be mounted on the rear of a motor driven machine which is supported solely on endless tractors, the motor being mounted on the opposite or forward end of the machine. While the said endless carrier will ordinarily be pivoted on the machine frame at varying inclination to adjust the depth of the trench to be excavated, the special means of mounting the carrier will not be set forth in this application in detail, but this case will be confined especially to the efficient adjustment of the boom.

With the foregoing and other objects in view which will appear as the description proceeds, the invention resides in the combination and arrangement of parts and in the details of construction hereinafter described and set forth in the appended claims, and illustrated in the accompanying drawings, in which—

Figure 1 is a side elevation of a telescopic

extension boom supporting an endless chain excavator, and shown contracted to its approximate limit;

Figure 2 is a similar view of the same structure, but shown adjustably extended to its approximate limit;

Figure 3 is a side elevation of a section of the boom and chain, showing in detail the adjusting rod and related parts, all on a much larger scale than the first two views;

Figure 4 is a side elevation of a supporting boom and endless chain mounted upon a tractor frame and shown in operation excavating a trench, a section being omitted to reduce space;

Figure 5 is a plan view of the boom section shown in Figure 3, parts being broken away;

Figure 6 is a transverse section of the boom taken in the plane indicated by the line 6—6 of Fig. 3, and

Figure 7 is a transverse section of the boom taken in the plane indicated by the line 7—7 of Fig. 3.

The drawings show the preferred form of my invention, but it will be understood that the improvements disclosed are not restricted to the exact details shown and that I reserve the right to make such minor changes therein, within the scope of appended claims, as may from time to time be found desirable.

My improved boom 10 is designed to support various endless carriers, which may comprise a single or double chain, or may include a greater number of endless elements and may be connected together by suitable transverse members which may serve other functions as well as that of connecting the parallel members traveling together. Such carriers may also be used for a variety of purposes, such as carrying excavating buckets, for conveying functions of material handled by receptacles, hooks or other conveying elements, or for loading purposes in general.

Whatever the character of carrier supported thereon, my boom will be adjustable in length, and will comprise at least two sections 11 and 12, the former 11 having a smaller inner end 13 intended to telescope into the larger inner end 14 of the section 12, as

shown. The result, as shown in Figs. 6 and 7, is that of telescoping tubes polygonal in cross section. The larger section 12 is formed of lateral and end plates 15 and 16, as shown in such cross section, with corner angle bars securing the longitudinal plates 15 and 16 together at their edges. The lower angle bars 17 are attached by their horizontal flanges to the upper surface of the lower plate 15, while the vertical flanges are applied outside the lower ends of the end plates 16; but the upper angle bars 18 are applied outside the upper plate 15, as well as the end plate 16.

Rivets 19, or other securing means fixedly secure the bars 17 to the plates 15 and 16, and thereby hold these plates in relative position and at the same time presenting an otherwise smooth lower surface for the boom. The horizontal flanges of the upper angle bars 18 are fastened to the upper plate 15 suitably, as by the rivets 21.

The smaller telescoping section 11 is formed of end plates 22 as viewed in Figs. 6 and 7, parallel with the end plates 16 of the larger section, but slightly spaced from the outer plates by the vertical flanges of angle bars 23 outside the edges of the plates 22 and the side plates 24 and 25 of the inner tube. The upper plate 25 of the inner tubular section is widely spaced from the upper side plate 15 of the larger section 12, and held in said spaced relation by inner angle bars 20 whose lower flanges are contiguous with, though unattached to, the angle bars 23 of the inner section 11. The vertical flanges of the bars 20 are apertured to receive therethrough a series of rivets 26 which serve to fasten the vertical flanges of the bars 18 and 20 as well as the upper edges of the side plates 16 therebetween.

It is evident that the angle bars 20 readily serve as spacing elements and permit slidable movement of the inner boom section 11 beneath said bars. In such movement, the horizontal flanges of the lower angle bars 23 will contact the upper surface of the horizontal flanges of the angle bars 17, the rivets 27 securing the plates 24 and 25 to the bars 23, having smooth outer end surfaces to move freely with such bars in contact with the bars 17 and 20. The nature of the telescoping structure above described clearly discloses the position of the inner boom section 11 adjacent the bottom of the outer section 12 and thereby provides a very stable connection for the two sections whether greatly extended or contracted.

The outer ends of the sections 11 and 12 are provided with conventional pairs of sprockets 28 over which the endless chains 29 are guided. Each chain is made up of the usual links some of which may be disconnected, for the purpose of lengthening or shortening the chains by removing or inserting certain links, as may be found necessary.

Guide pulleys 30 are provided upon the outer section 12 for guiding the chains between the ends of the boom.

Adjustment of the two sections 11 and 12 telescopically, is accomplished in two ways. First, the eyes 31 of longitudinal bars 32 may be connected with a transverse pull bar 33, when the latter is connected with the inner end 13 of the smaller section 11, in two different positions which provide a different degree of extension of the boom; and second, the bars 32 are screw-threaded bolts at the sides of the boom, connecting the two sections 11 and 12 together, their ends opposite the ends carrying the eyes 31, piercing lateral lugs 34 on the larger section 12, and provided with securing nuts 35 on each side of the lugs, whereby the two sections may be adjusted relatively by manipulating the said nuts on the bars. The two forms of adjustment may be employed separately or at one time. That is, the eyes 31 with the pull bar 33 may be shifted from the position shown in Fig. 1 to that shown in Fig. 2, and at the same time the nuts 35 may be screwed further up on the bars 32, from which it will be evident that either form of adjustment may be employed without the other.

Referring especially to Figs. 3, 5, 6 and 7, it will be noted that the pull bar 33 extends through a slot in the plates 22 as well as in the plates 16, the projecting ends of the pull bar serving for attachment of the eyes 31 thereon, as shown with particular clarity in Fig. 7.

To permit longitudinal adjustment of the bars 32 in the lugs 34 by means of the nuts 35, the engaging eyes 31 must move, together with the cross-element—the pull bar 33, towards and from the said lugs. To accomplish this, the end plates 16 of the larger section 12 are provided with elongated slots 36 which are shown very clearly in Fig. 2 of the drawings, indicated in Fig. 7, but are concealed by the bars 32 in Figs. 1, 3 and 4. The slots 42 in the plates 22 for receiving the pull bar, are not especially elongated, but have the form of a cross-section of the bar 33.

Considering this structure recited in the paragraphs immediately preceding, it will be evident that the pull bar may remain inserted in the plates 22, while the ends of the bar are adjusted in the slots 36 when the nuts 35 are moved upon the rods 32. When the bar 33 is removed, the inner section 11 may be moved from the position shown in Fig. 2 to that shown in Figs. 1 and 3. For this reason, the section 11 is provided with two pairs of slots 42 to receive the pull bar, all of which slots 42 are in the plates 22. If a wider variation is desired in the length of the boom, more than two pairs of slots may be provided in the plates 22, such other slots being added in alinement with the slots shown in Figs. 1, 3 and 4.

I claim a very positive advantage in the assembling of the sections 11 and 12, both polygonal in cross-section, and here shown as rectangular. Not only is there combined in this structure a strong, telescopically adjusted boom, and one capable of great resistance to twisting strains, but also one which is remarkably light in weight when its great strength is appreciated. Its great resistance to transverse strains is equally pronounced.

As illustrated in Fig. 4 of the drawings, the boom 10 is itself pivoted upon the shaft 37 mounted in a suitable frame of a vehicle trencher, this shaft also bearing the upper sprockets 28 upon which the chains 29 are guided, and the latter provided with buckets 43. The upper section 12 of the boom is provided with a pair of lugs 38, one of which is seen in Fig. 4. These lugs are connected with a suitable portion of the trencher frame, usually above the tractors 39, by brace bars 40 to hold the swinging boom at the proper inclination to the vertical while in operation. Suitable masts 41 are also included in the supporting frame, but these parts will not be further described, since the frame structure of the excavating machine, other than that of the boom itself, is not claimed in this case. Reference is made to applicant's pending application Ser. No. 196,745 for swinging conveyor trenchers, for further details of an excavating machine upon which my adjustable boom may be used.

It is well known that adjustability of a boom carrying endless chains bearing excavating buckets, is especially useful to vary the depth of trench to be excavated. Since the pivot upon which the upper sprocket of the boom is mounted is ordinarily permanent and fixed, such adjustment will usually be made by varying the length of boom. Of course, adjustment of the brace bars 40 may vary the depth of trench by varying the inclination of the boom, yet there is a practicable limit to the extent that such inclination may be varied; and my improved form of means for lengthening the boom enables the user to increase the depth of trench without moving the lower end of the boom too near the frame of the machine. Difficulties have been encountered in the past in attempting telescopic adjustment of the boom, but the weakening of the boom when extended has resulted in general abandonment of the structure as attempted.

Former difficulties in the construction of telescopic adjusted booms I have overcome, I believe, by the provision of the tubular sections 11 and 12 of the boom, providing the hollow polygonal sections built up from separate plates connected at their edges by the strong angle plates or bars, and the two sections being so related that the angle plates of one will bear directly upon those of the

other section. This latter construction results in very efficient and durable boom structure and makes possible that the wear between the sections in the proposed adjustment, will be borne wholly by the angle bars.

The operation of the device is as follows:— The outer section 12 of the boom may be built up first by assembling the plates 15 and 16 by securing their edges by the angle bars 17 and 18, the bars 17 being positioned above the lower plate 15 to provide a substantially smooth lower surface for the main portion of the boom. The angle bars 20 will be positioned on the inner surface of the plates 16 when the rivets 26 are applied. The lugs 34 are carried by this section. The section 12 is now complete, and after the inner section 11 has been built up in much the same manner and as before described, section 11 may then be inserted within section 12, resulting in the very efficient arrangement of the lower angle bars 23 resting upon the bars 17, while the upper bars 23 bear directly upon the angle bars 20.

The threaded ends of the rods 32 are now inserted in the lugs 34, nuts 35 being first applied to the rods before insertion, and the other nuts screwed on for adjustment on the opposite side of the lugs. The pull bar 33 is now inserted transversely through the slots 36 and one pair of slots 42 in the end plates 22 of section 11. The length of the boom is now adjusted for the length of chains desired, by selecting the particular slots 42 to be used, or by changing the position of nuts 35 on the rod 32.

My present invention is not particularly concerned with the manner of mounting the boom upon the machine frame, but concerns the structure of the adjustable boom per se. While the boom is shown pivoted upon the shaft 37 to which power is applied from a suitable gearing, this is merely illustrative and the power shaft and hinge shaft need not be identical. Other traction means may also be employed, and other mechanism used to vary the inclination of the assembled boom.

Having thus described my invention, what I desire to claim and protect by Letters Patent of the United States is—

1. In an endless chain and bucket excavating mechanism, an adjustable boom comprising telescopic tubular metal sections, a transverse pull bar extending through one section with its ends protruding externally, and laterally positioned rods having eyes on one end thereof fitting the ends of said bar, and the opposite ends connected with the other section.

2. In an endless chain and bucket excavating mechanism, a longitudinally adjusting boom comprising telescopic tubular sections rectangular in cross section, and each comprising parallel side and end metal plates mounted in pairs and whose edges are se-

curely fixed in spaced relation by angle bars riveted thereto, the angle bars of the inner section being slidably mounted upon certain angle bars at the corners of the outer section, and means for holding the boom sections in longitudinally adjusted relative position.

3. In an endless chain and bucket excavating mechanism, an adjustable boom comprising telescopic tubular metal sections polygonal in cross section and one of them provided with laterally extending lugs, a transverse pull bar extending through apertures in the walls of one section with the ends of the bar protruding externally, and laterally positioned rods extending lengthwise of the boom and having eyes on one end thereof fitting the ends of said pull bar, and the opposite ends adjustably connected with the said lugs.

4. In an endless chain and bucket excavating mechanism, an adjustable boom comprising telescopic tubular sections, one of which sections is rectangular in cross section and comprises parallel side and end metal plates whose edges are securely fixed in spaced relation by angle bars riveted to said plates, and the inner section having transverse pairs of openings spaced apart in the direction of the length of the boom, a transverse pull bar extending through one pair of said openings with its ends protruding externally, and laterally positioned rods having eyes on one end thereof fitting the ends of said bar, and the opposite ends connected with the other section.

5. In an endless chain and bucket excavating mechanism, a longitudinally adjustable boom comprising telescopic sections each being formed of elongated metal plates secured together in spaced relation at their angular edges by angle bars riveted to said plates, and external means for connecting the two boom sections in relative adjusted position.

6. In an endless chain and bucket excavating mechanism, an adjustable boom comprising telescopic tubular metal sections one of which has lateral extending lugs, a transverse pull bar extending through the other section with its ends protruding externally, and laterally positioned rods having eyes on one end thereof fitting the ends of the bar, and the opposite ends of the rods adjustably connected to said lugs.

7. In an endless chain and bucket excavating mechanism, an adjustable boom comprising telescopic tubular sections, the latter being polygonal in cross section and comprising longitudinal metal plates secured together in spaced relation at their edges by angle bars riveted thereto, certain plates of the inner section having transverse pairs of openings spaced apart in the direction of the length of the boom, a transverse pull bar extending through any one of said pairs selectively and with its ends protruding externally, and connecting means for rigidly holding

the said bar at a predetermined distance from the ends of the outer section.

8. In an endless chain and bucket excavating mechanism, an adjustable boom comprising telescopic tubular sections, the latter being rectangular in cross section and comprising longitudinal metal plates secured together at their edges, certain plates of the inner section having transverse pairs of openings spaced apart in the direction of the length of the boom, a transverse pull bar extending through any one of said pairs selectively and with its ends protruding externally, screw-threaded connecting rods having eyes on one end thereof fitting the ends of the bar, laterally extending lugs positioned on the outer section, the said lugs having apertures for receiving the said rods there-through, and certain plates of the outer section having elongated slots through which the pull bar may extend transversely and be moved therein longitudinally of the boom, and locking nuts carried by said rods on either side of said lugs, whereby the length of the boom may be adjusted by mounting the bar in different pairs of said openings, or changing the position of said nuts on the rods, or by both adjustments.

9. In an endless chain and bucket excavating mechanism, an adjustable boom comprising telescopic tubular sections rectangular in cross section, and each comprising parallel side and end elongated metal plates whose edges are securely fixed in spaced relation by angle bars riveted to said plates adjacent the edges, the inner of said sections fitting within the outer sections neatly in a lateral direction, but being shallower in depth than the outer section and held adjacent the bottom plate of said outer section by angle bars riveted to the upper side walls of the outer section and within the latter, whereby to space the upper plates of the two sections apart, and means for holding the boom sections in adjusted relative position.

In witness whereof I have hereunto set my hand this 21st day of January, A. D. 1929.

AUGUSTUS J. PENOTE.