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MOUNTING CLAMP FOR TORSIONAL DAMPERS

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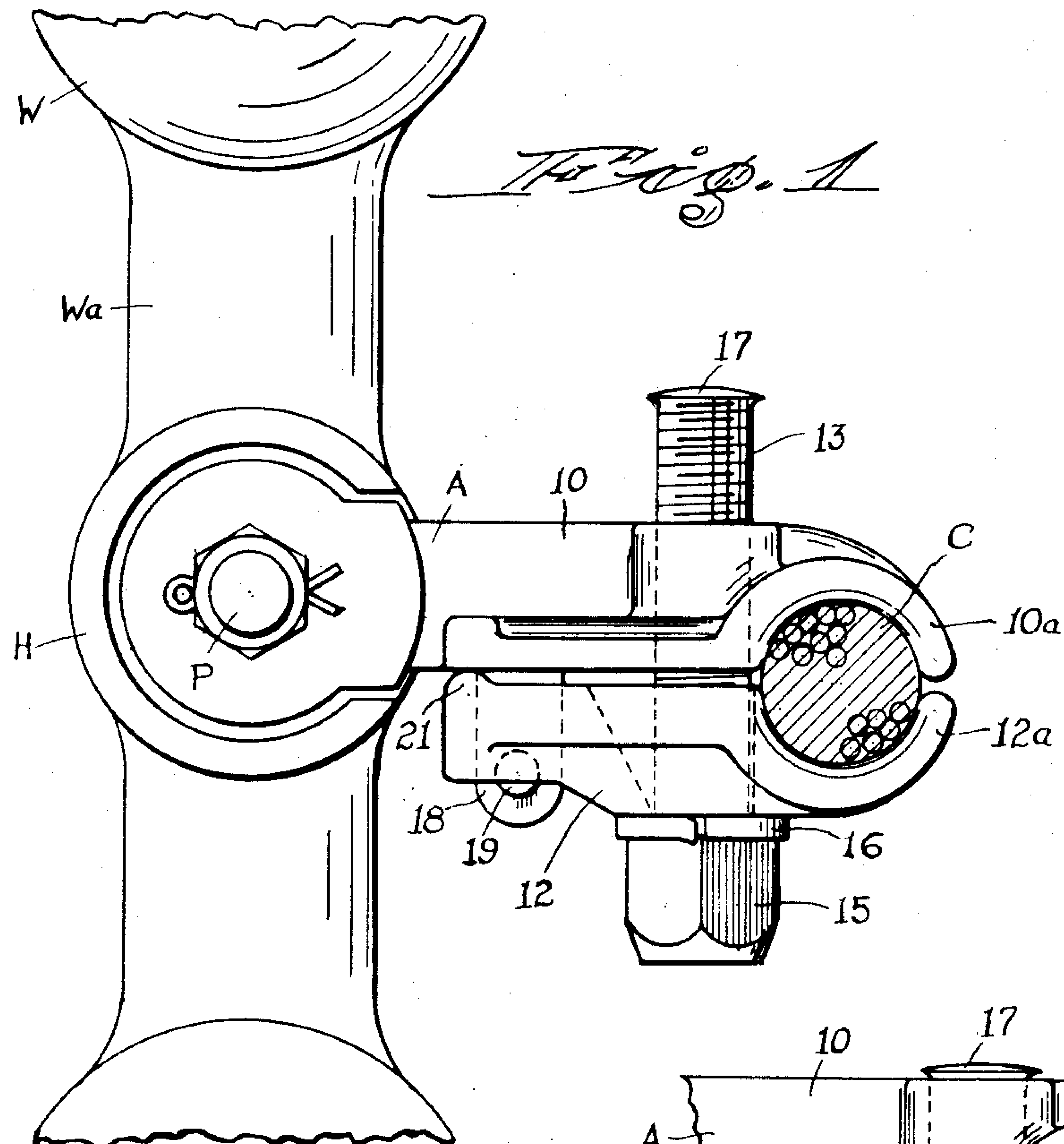

Fig. 1

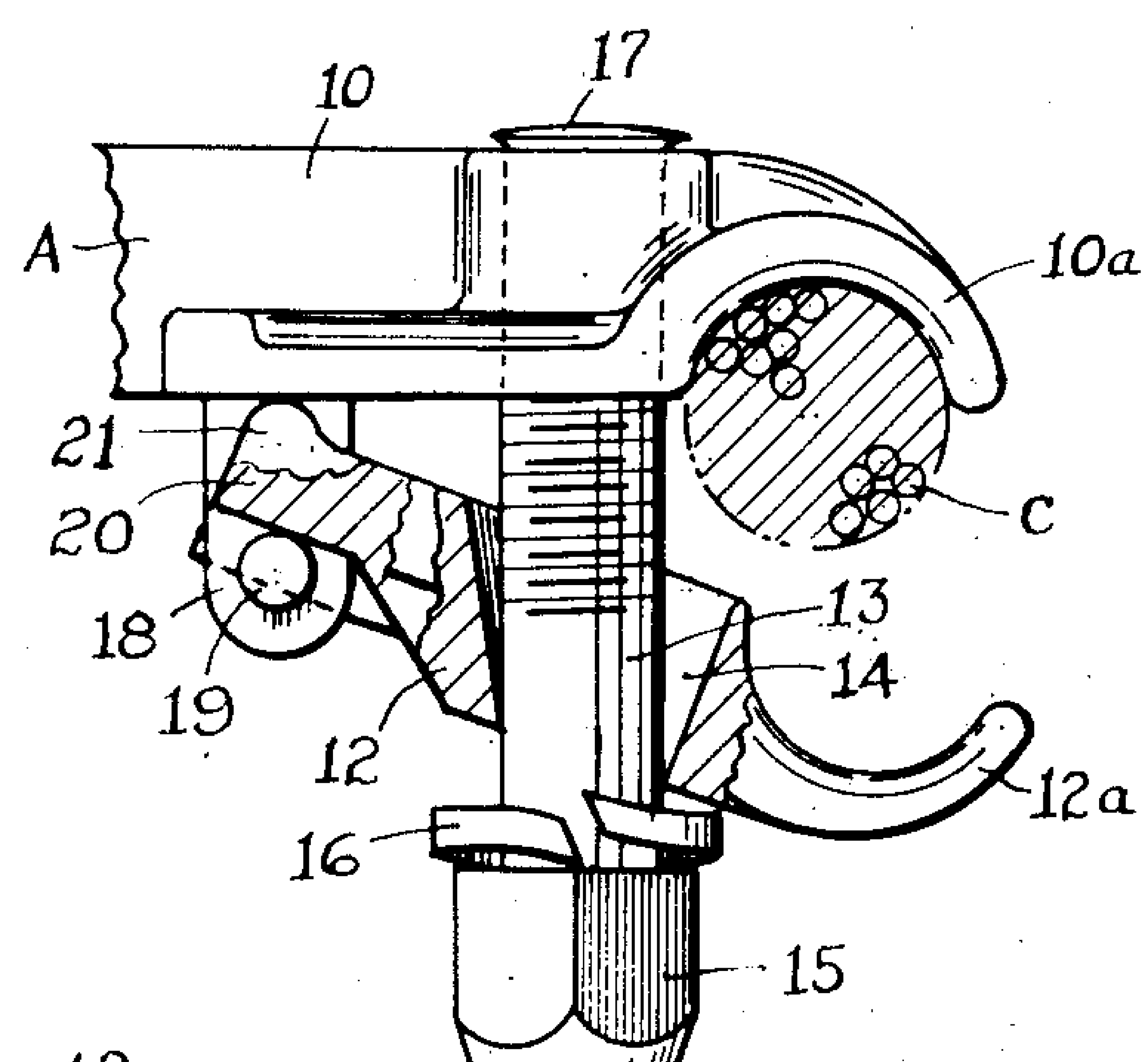

Fig. 2

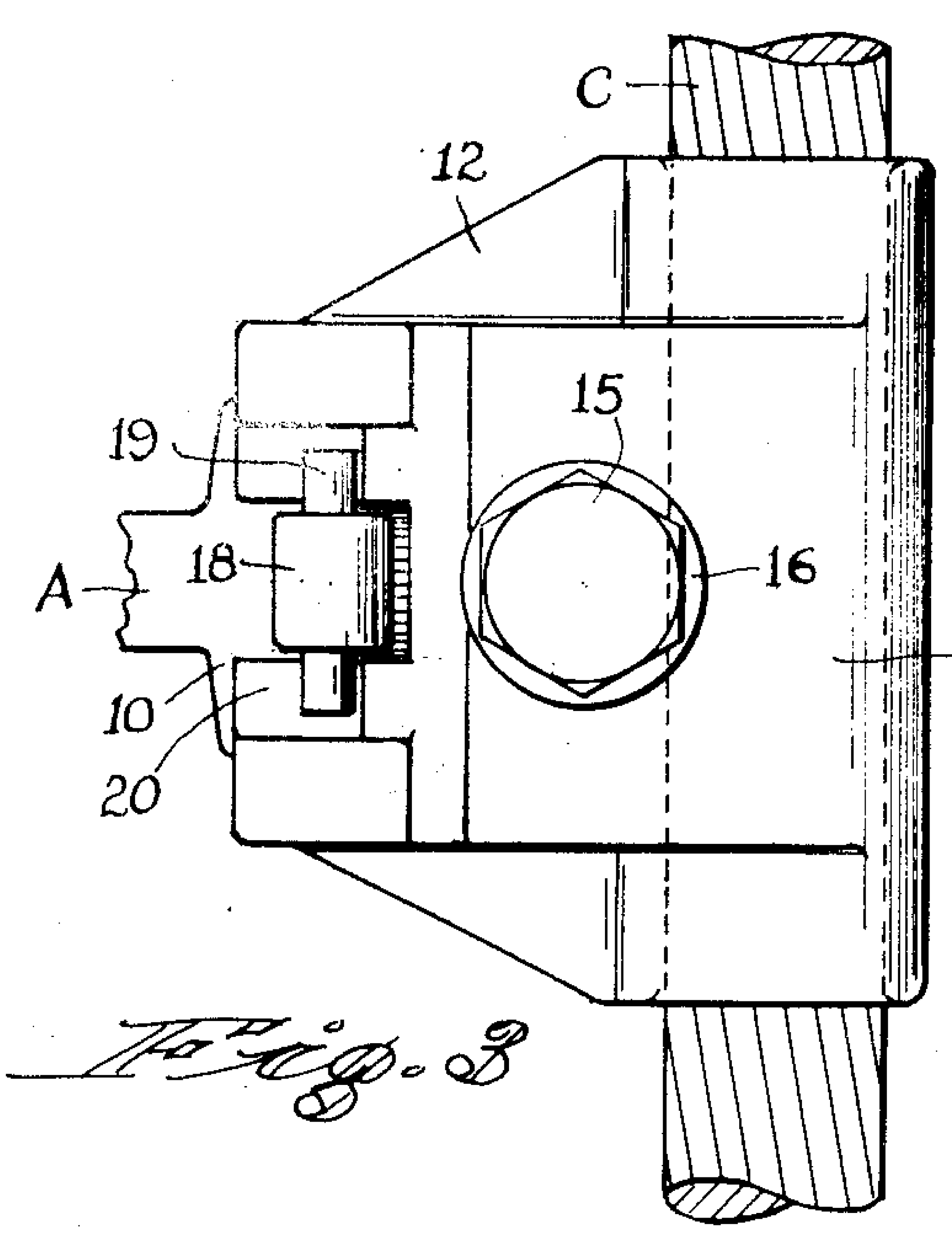

Fig. 3

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MOUNTING CLAMP FOR TORSIONAL DAMPERS

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2 Claims. (Cl. 24—248)

This invention relates to improvements in torsional dampers, sometimes known as vibration dampers, such as are used on high voltage, long-distance transmission lines. The conductors of these transmission lines are multi-strand wire cables, very often of more than an inch diameter.

In practice these cables are usually suspended from structural steel towers which are spaced a thousand feet apart, or more, the spans of the cable or conductor between the towers being in catenary sag or slack.

The transmission lines are the connection links between generating stations and distribution points, and important consideration is given to their mechanical and electrical characteristics.

Briefly, such dampers consist of an arm firmly clamped to the conductor and extending substantially horizontally therefrom, and substantially at right angles to the axis of the conductor. On the distal end of the arm is a weight pivoted for limited oscillatory or rocking movement.

In its preferred form the weight is of dumb-bell-like shape, that is, there are two opposed heads or knobs joined by a neck or shank portion which has a median hub through which the pivotal pin or bolt which connects the weight to the horizontal arm passes. The "dumb-bell" stands vertically, that is one head or knob to the top, the other to the bottom, and is posed at the pivotal point. However, the specific shape of the weight is immaterial to the present invention.

In such structures associated portions of the weight are spaced from the arm at the pivotal point by certain tightly placed rubber washers or bushings which act to resiliently constrain or suppress the oscillatory motion of the arm due to inertia of the weight.

The structure of the mounting clamp, per se, which connects the damper, or more specifically the damper arm, to the conductor is the exclusive subject matter of the present invention.

Previous mounting clamps were characterized mainly by two complemental jaws, one being a fixed jaw and formed as one with the weight arm, the other being entirely free of the arm. The two jaws were clamped to the conductor in opposed position by means of U-bolts arranged one on each side of, or flanking, the weight arm. The webs of the U-bolts encircled one jaw while the shanks penetrated through openings in the other, the two being drawn together tightly against the conductor by nuts threaded on the ends of the U-bolt and tightened against a face of the jaw through which the shanks extended.

There are certain dominant objections to this former type of mounting. Four bolts and their accompanying washers had to be applied each time the damper was affixed to the conductor, and similarly removed when demounting the damper. Including the U-bolts with the nuts and their washers it will be seen that there were ten loose parts for the linemen to contend with at the site; considering the loose complemental jaw there were eleven. All these parts had to be assembled during the mounting operation.

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With the use of such structure it is impossible for the linement to apply the damper to the conductor, or to demount it, while the latter is alive, and to de-energize the line obviously inconveniences the entire countryside of power consumers. Moreover, a platform or scaffolding of some kind had to be arranged on the tower for close access to the damper or its intended location.

The present invention consists essentially of a clamp structure comprising a fixed or stationary upper jaw integral with the weight arm of the vibration damper, and an articulated complemental lower jaw, the two jaws being effectively engageable with a conductor by the use of a single bolt threaded through the upper portions of the structure.

The invention is further characterized by the lower jaw, notwithstanding a loose or free slip-on connection provided for tolerance or self-adjustment, being inseparable from the clamp structure once the bolt is in place, and by the bolt itself being made inseparable from the structure after assembly.

One important object of the invention is to provide a torsional damper assembly which will be wholly intact at the site prior to the commencement of the mounting procedure. That is to say, there will be no free parts or members to fit together either before or during such operation.

A second important object is to provide a damper which may be conveniently and effectively mounted on or demounted from a live or hot conductor cable, that is without shutting off the current at its source or elsewhere.

A third important object is to provide a damper wherein the mounting parts or members may not separate or come apart through accidental or unintended means before mounting, during such operation, or during and after demounting.

A fourth important object is to provide a damper which may be mounted on or demounted from the conductor wholly by the use of instruments known in the line-hardware trade as hot-line sticks. That is to say, at no time will it be necessary for the linemen to come into bodily contact with the damper or its components during either the placement or removal of the damper from the conductor cable.

A fifth important object is to provide a damper which may be mounted or demounted by linemen from a position on a portion of the tower at a level (the most practicable level) lower than the conductor.

These together with other objects which may later appear are attainable by the structure and combination of parts as hereinafter more fully described, illustrated on the accompanying drawing and specifically claimed.

Referring now to the drawing in which like reference numerals refer to like parts in all the views:

Figure 1 is a side elevation of a damper clamp as constructed in accordance with the present invention, shown in effective or closed position on a conductor (shown endwise in cross-section), showing also a broken portion of a conventional or currently used dumb-bell type damper weight.

Figure 2 is a side elevation of the damper clamp opened and free of the conductor.

Figure 3 is a bottom view of the clamp.

It is assumed that the function of torsional dampers is fully understood. The drawing shows a weight W of a conventional torsional damper, which, by way of illustration but not for limitation, is the type known as a dumb-bell weight. A hub of the weight, or the weight itself, is pivoted to a boss (not shown) on the distal end of the weight sustaining arm A which extends horizontally as a fixture of the clamp (any clamp) which engages the conductor. In a dumb-bell weight, a median hub H comprises the portion pivoted to the arm boss by the pin or bolt P. The axis of the pin P is horizontal, and parallel with that of the line conductor C.

The clamp, broadly speaking, consists of a fixed upper jaw **10** and a loosely articulated complemental lower jaw **12**. The latter jaw is articulatingly connected to the first by means of a loose jointed or slip-on connection, the specific description of which is to follow.

The fixed jaw is an integral portion of the weight arm A and consists in fact of a broadened portion of such arm including an arcuate conductor grip **10***a*. Dimensionally the articulated jaw substantially conforms to the fixed jaw, and it similarly includes an arcuate conductor grip **12***a* which complements the first grip.

A single bolt **13** passes freely through an oversized aperture **14** in the articulated jaw **12**, and threads vertically through the fixed jaw **10**. The bolt is disposed close to the grips and remote from the joint.

The bolt is positioned head **15** down, and a lockwasher **16** is interposed between the head and the lower jaw. While the clamp is in open or ineffective position the articulated or lower jaw **12** drops so that it rests upon the lockwasher **16** which in turn rests on the bolt head **15**.

While the provision of such a washer **16** follows common mechanical practice, it need not be held to constitute a component of the clamp structure. Therefore, hereinafter and in the claims it will be assumed in the cause of simplicity that the bolt head directly engages the articulated or lower jaw. Here accordingly let it be said that while the clamp is in open or ineffective position the jaw **12** drops onto the bolt head **15**.

Preferably the tip of the bolt **13** is swaged as at **17** in order to prevent the bolt from withdrawal once the clamp has been assembled for use.

The exact length of the bolt **13** is determined by the width of the gap between the lips of the arcuate grips **10***a* and **12***a* when the jaws are fully opened or agape. In turn, the gap is estimated by the diameter of the conductor which is to support the clamp. The clamp should be particularly made for a conductor of a given diameter, and the gap should somewhat exceed such diameter in order that the lips of the grips **10***a* and **12***a* may clear the conductor as the clamp is placed in position thereon. When the clamp is properly positioned on the conductor the jaws are effectively closed by screwing home the bolt **13** and tightening it until the grips are frictionally immovable about the conductor, and in doing so obviously the articulated jaw **12** is lifted bodily from open position by its engagement with the bolt head.

Since the clamp carries a load of great cantileverage it is important that the internal faces of the grips **10***a* and **12***a* lie accurately co-circumferentially of the conductor, and that the centres of both arcuate faces of the grips coincide and are coaxial with the conductor. Consequently there must be no fixed axis for the articulation of the lower jaw **12**. Rather there should be means provided for a movement tolerance so that the articulated jaw may shift relatively to the fixed jaw and self centre and self level itself to the conductor, yet having a sustaining connection with the fixed jaw.

The sustaining connection should be at a point remote from the functional end of the clamp in order to permit the lower jaw to drop for conductor clearance. Moreover, in order to attain maximum pressure on the grips by the bolt **13** the jaws should have no interchange of contact except in the mutual zone of articulation.

In its preferred form the articulation consists of a depending tongue or hanger **18** on the fixed jaw, the tongue having a pair of opposed lugs or trunnions **19**. The end portion of the articulated or drop jaw opposite its functional end is notched to form a pair of longitudinal legs or fingers **20** whch overlie the lugs **19** on either side of the tongue **18**. These lugs sustain the articulated end

of the lower or drop jaw while the clamp is agape, the bolt head, as previously specified, supporting the opposite or functional end of this jaw.

Rising from the upper face of each of the legs **20** are aligned transverse spacers in the form of beads or ribs **21**. These beads space the facing surfaces of the jaws so that there is no interchange of contact between them anywhere, that is, except where the spacers themselves point contact the fixed jaw. All the separable members of the articulated joint are roughly (not precisely) fitted, that is, no part exactly fits another, and therefore the lower or drop jaw is free to wobble and to move longitudinally within a certain range until the grips begin to engage and gradually tighten to the conductor on turning the bolt.

The range of longitudinal movement of the articulated jaw is limited relatively to the fixed jaw by the width of the opening **14** in one direction and by the tongue **18** in the opposite direction.

In assembling the clamp structure, prior to the insertion of the bolt the articulated jaw is merely slipped into position with the legs **20** straddling the tongue **18** and interposed between the lugs **19** and the internal face of the fixed jaw. Next the bolt is led through the orifice **14** and threaded through the fixed jaw. Finally the tip of the bolt shank is swaged to a greater diameter, say, by means of a pene sledge. None of the parts are then separable.

So-called hot sticks are used for handling the damper in mounting on the conductor. Preferably two linemen are detailed. One operator, provided with a hot stick equipped with a claw or grapple of any suitable kind which will grasp the weight, say, by a neck portion W*a*, places the damper in proper operative position, the grip **10***a* of the upper jaw resting on the conductor C, see Figure 2. While the first operator or lineman thus holds the damper, the second, who is provided with a hot stick equipped with a socket wrench or the like, conforming to the bolt head **15**, tightens the bolt, and hence the jaws against the conductor.

We claim:

1. In a conductor clamp for torsional dampers, the damper including a weight supporting arm and a fixed jaw forming an integral part of said arm; an articulated drop jaw having a loosely jointed connection with and complementing the fixed jaw, said jaws having complemental arcuate conductor grips at their outer ends and transversely slidable fulcrum contacts at their inner ends, said jaws having a gaping conductor receiving position and a closed conductor gripping position, a head down bolt led through an oversized bolt aperture in the middle of the articulated jaw and threaded through the fixed jaw, said bolt having a jaw gaping position and a jaw gripping position, the articulated jaw being sustained when in jaw gaping position partially by the head of said bolt and partially by said jointed connection, whereby said arcuate conductor grips may center themselves over said conductor during clamping operation without producing any diametral shearing stresses in said conductor, said loosely jointed connection consisting of a tongue depending from the fixed jaw and provided with a pair of opposed lateral lugs, and a pair of longitudinal legs on the articulated jaw slidably straddling the tongue and loosely interposed between the lugs and the fulcrum contact surface of the fixed jaw.

2. In a conductor clamp for torsional dampers, the damper including a weight supporting arm and a fixed jaw forming an integral part of said arm; an articulated drop jaw having a loose slip on connection with and complementing the fixed jaw, said jaws having complemental arcuate conductor grips at their outer ends and transversely slidable fulcrum contacts at their inner ends, said jaws having a gaping conductor receiving position and a closed conductor gripping position, a head down bolt led through an oversized bolt aperture in the middle of

the articulated jaw and threaded through the fixed jaw, said bolt having a jaw gaping position and a jaw gripping position, the articulated jaw being sustained when in jaw gaping position partially by the head of said bolt and partially by said connection, whereby said arcuate conductor grips may center themselves over said conductor during clamping operation without producing any diametral shearing stresses in said conductor, said loose slip on connection consisting of a tongue depending from the fixed jaw and provided with a pair of lateral lugs, and a pair of longitudinal legs on the articulated jaw slidably straddling the tongue and loosely interposed between the lugs and the fulcrum contact surface of the fixed jaw.

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