Jan. 3, 1956 W. F. LUDWIG 2,729,133

DRUM TUNING MECHANISM

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Fig-1

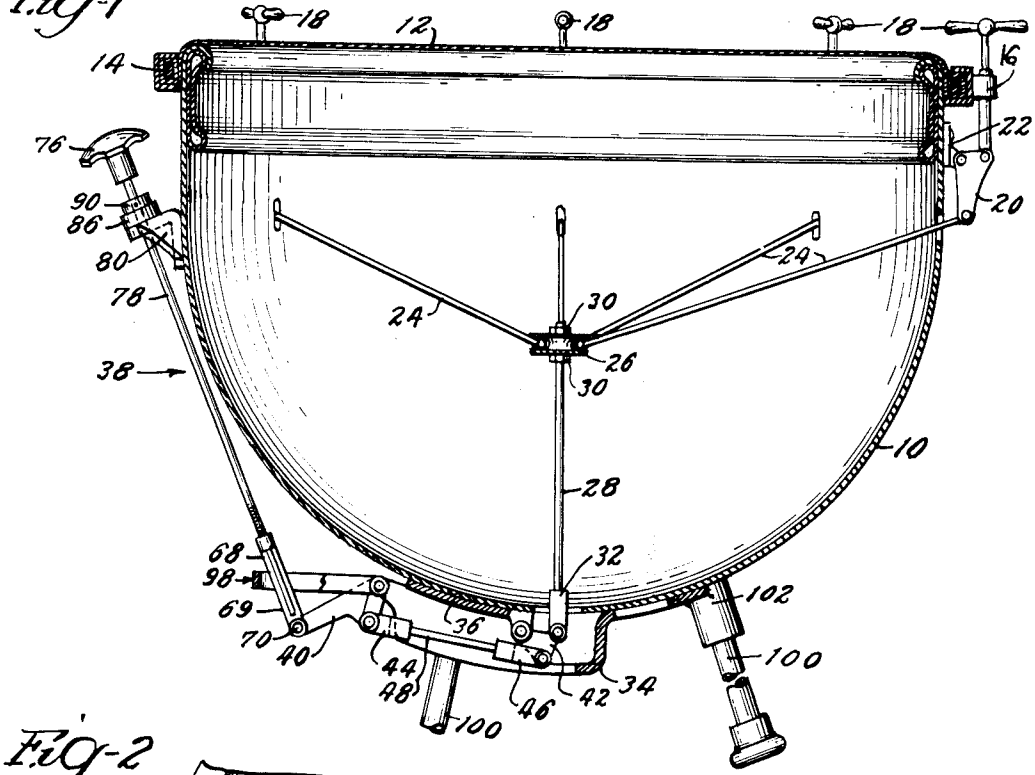
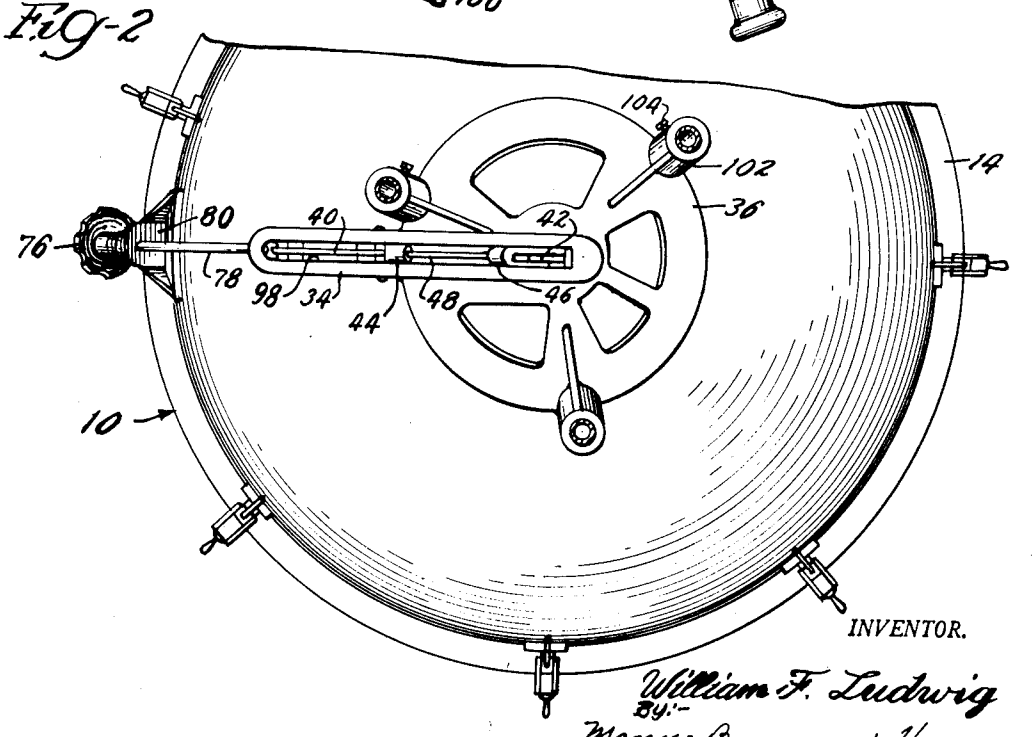


Fig-2



INVENTOR.

William F. Ludwig

By:-

Mann, Brown and Hansmann

Attys.

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Fig-3

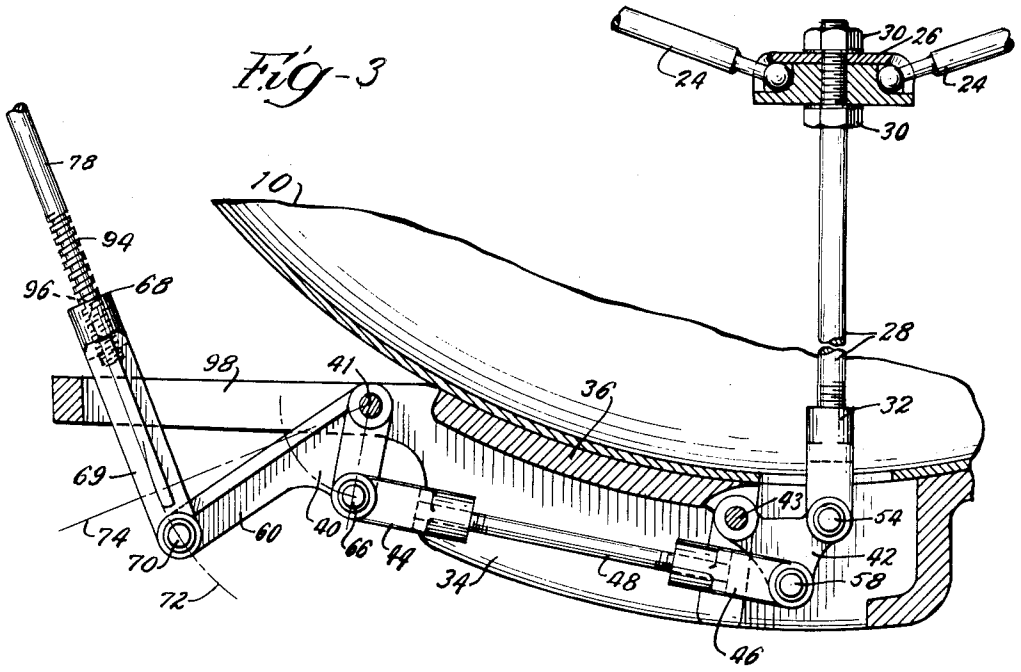

Fig-4

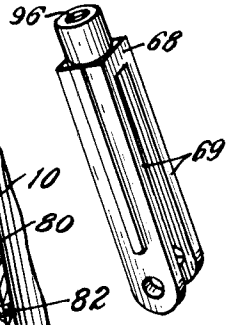

Fig-5

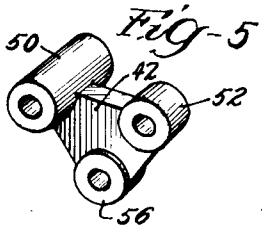

Fig-6

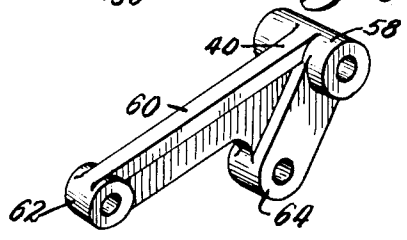

Fig-7

INVENTOR.
William F. Ludwig
BY
Mann, Brown and Hansmann
Attys.

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2,729,133

DRUM TUNING MECHANISM

William F. Ludwig, Chicago, Ill.

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3 Claims. (Cl. 84—419)

This invention relates to drums and tuning mechanisms therefor. More particularly, it is concerned with a tuning device for tympani though the principle may be applied to other types of drums.

Tympani or kettle drums are used in pairs and it is necessary to vary the tuning thereof at frequent intervals. Accordingly, rapid and easy tuning is an all-important feature in efficient tympani.

In the standard size tympani, the large kettle is 28 inches in diameter and the small kettle is 25 inches in diameter, there being one octave between the two. Each has a range of five tones. On the smaller kettle the tension increases from a pull of 80 pounds to a pull of 1500 pounds when tuning from the lowest natural note "B" to the high note "F."

The problem of providing a mechanism which will tune from one extreme to the other with a minimum of effort has been before the industry for many years and numerous solutions have been suggested. There are in existence many types of foot pedal mechanisms for tuning tympani but the present invention relates to hand-tuned tympani, the area in which the tuning problem has been most acute.

In the interest of speed and uniformity, it is, of course, necessary to accomplish the tuning by adjusting a single instrumentality, and all the known devices of this type are only satisfactory when tuning low notes but become difficult to adjust when the high notes are reached.

It is the principal object of the present invention to provide a drum-tuning device having a single, fast-acting, hand-controlled mechanism that provides an increased mechanical advantage as the tuning tension increases; that is reliable, simple, and positive in operation; that is compactly arranged internally of a housing; that is economical to produce; and that may be easily packed for transportation.

Other objects and advantages of the invention will be apparent during the course of the following description.

In the accompanying drawings forming a part of this specification and in which like numerals are employed to designate like parts throughout the same:

Fig. 1 is a sectional elevational view of a drum in accordance with the present invention;

Fig. 2 is an underneath view of the drum of Fig. 1;

Fig. 3 is a detailed sectional view of the leverage mechanism of the present invention;

Figs. 4, 5, and 6 are detailed perspective views of certain of the levers of the leverage mechanism; and

Fig. 7 is a detailed sectional view of the hand-operated screw mechanism.

It should be understood that the description of the preferred form of the invention is for the purpose of complying with section 112, title 35 of the United States Code, and that the appended claims should be construed as broadly as the prior art will permit.

Briefly the present invention is concerned with a hand-operated single screw adjusting mechanism that is mounted on a conventional tympanum. In the preferred embodiment a leverage system is mounted within a housing that is secured to the bottom of the kettle and this leverage system provides an increasing mechanical advantage as the tension on the drum head increases. The operating mechanism and leverage system are preferably used in conjunction with the conventional peripheral adjusting screws and cooperating bell cranks that serve to initially tune the drum head.

Referring now to the drawings, there is illustrated a substantially hemispherical kettle **10** that may be made of copper, alumium, or any other suitable material. A drum head **12** is held in an annular hoop **14** that telescopes over the top of the kettle. The hoop **14** is provided with a series of equally spaced bosses **16** around its outer periphery and these bosses receive, in threaded engagement, a series of adjusting screws **18**. The screws **18** cooperate with bell cranks **20** that are attached to the side of the drum by means of brackets **22**. At their lower ends the bell cranks **20** are attached to a series of radial tension rods **24** which are actuated by the mechanism of the present invention. The arrangement of the hoop **14**, adjusting screws **18**, bell cranks **20**, and radial tension rods **24** is old and forms no part of the present invention.

The radial tension rods are received in sockets provided in a spider **26** which is secured to an axial tension rod **28** by means of a pair of nuts **30**. The other end of the rod **28** is threadedly received in an axially tapped hole provided in a connecting link **32**. The connecting link **32** is pivotally secured to the leverage mechanism of the present invention.

As best seen in Figs. 2 and 3, the leverage mechanism is mounted in a housing **34** formed integrally with a base plate **36**, the base plate **36** being secured to the bottom of the kettle **10**. The housing **34** extends from the center of the base plate **36** outwardly a sufficient distance to receive the lower end of the operating mechanism designated generally at **38**. The leverage mechanism consists of a pair of bell cranks **40** and **42** pivotally mounted in the housing **34** on a pair of trunnion pins **41** and **43** respectively. The bell cranks are arranged in a common plane and a connecting linkage, comprising a pair of levers **44** and **46** respectively, and a threaded rod **48** joining the two, pivotally engages the bell cranks.

The inner bell crank **42**, as shown in Fig. 5, is of a generally triangular shape and is provided with bosses at each of the corners. The boss **50** which receives the trunnion pin **43** is somewhat larger than the others. The lower end of the connecting link **32** is bifurcated and straddles the boss **52**. These parts are pivotally connected by a pin **54**. The lever **46** is also bifurcated to straddle the boss **56** and is pivoted thereto by a pin **58**.

It should be noted that the bell crank **42** is arranged so that as the axial tension rod **28** is pulled downwardly, the effective leverage between bosses **50** and **56** increases. In other words, as the tension on the axial rod **28** increases, the mechanical advantage provided by the bell crank **42** also increases and compensates for the increased tension. In this manner the tension on the connecting linkage **44**, **46**, and **48** increases at a slower rate than does the tension on the rod **28**.

The bell crank **40**, as shown in detail in Fig. 6, also has a large boss **58** which receives the trunnion pin **41**. The longer arm **60** of this bell crank is provided with a boss **62** and the shorter arm is provided with a boss **64**. The lever **44** is bifurcated to straddle the boss **64** and is held in pivotal engagement therewith by a pin **66**.

The operating mechanism **38** is connected to the longer arm **60** of the bell crank **40** by a bifurcated lever **68**, the arms **69** of which straddle the boss **62** and are pivotally secured thereto by a pin **70**.

The arrangement of the bell crank **40** is another im-

portant feature of the present invention. Referring again to Fig. 3, in which the line **72** indicates the path of travel of the pin **70** and the line **74** indicates a line drawn through the center line of the pin **41** perpendicular to the path of travel of the lever **68**, it may be seen that as the bell crank **40** pivots clockwise about the pin **41**, the effective leverage of the arm **70** increases as the line **74** is approached. Ideally, this point corresponds to the maximum range to which it is desired to tune since the effective leverage begins to decrease once this point is passed. Thus the outer bell crank **40** is arranged to also provide an increasing mechanical advantage as the applied tension increases.

According to the present invention, the bell cranks **40** and **42**, each of which provides an increasing mechanical advantage as the tension increases, are coordinated so that the tension in the lever **68** remains substantially constant as the drum is tuned from the low notes to the high notes. Therefore, the tuning effort is unchanged over the entire range.

As shown in Figs. 1 and 7, the operating mechanism is secured to the drum **10** adjacent the top of the drum. This arrangement is sturdy but more important it facilitates tuning in that the operating mechanism is readily accessible. The operating mechanism consists of a tuning knob **76** removably mounted on a shaft **78** which is threadedly engaged with the lever **68**. A bracket **80** is secured to the side of the drum **10** by a pair of screws **82**. The bracket **80** is apertured to receive the neck portion **84** of a cup-shaped lower race **86** of an end truss ball-bearing assembly. A plurality of balls **88** ride in the lower race and freely support an upper race **90** that is pinned to the shaft **78**, as at **92**. This end truss ball-bearing assembly permits the shaft to turn in its bearing support with a minimum of resistance.

At the bottom end, the shaft **78** is provided with a screw thread **94** that cooperates with a tapped hole **96** formed at the top of the bifurcated lever **68**. The shaft **78** and lever **68** extend into an opening **98** provided in the housing **34** and the adjacent side edges of the housing guide the movement of the lever **68**.

The operation of the leverage system is simple and efficient. When it is desired to increase tension, the knob **76** is turned so as to cause the lower end of the shaft **78** to draw the lever **68** upwardly. This pivots the bell cranks **40** and **42** clockwise, as viewed in Figs. 1 and 3, and draws the axial tension rod downwardly. Since the spider **26** is rigidly mounted on the rod **28**, it will move downwardly and exert increased tension on the radial tension rods **24**. The rods **24** pivot the bell cranks **20** to pull the hoop **14** and drum head **12** tightly down onto the kettle **10**.

During the above operations, the bell cranks **40** and **42** are each approaching a condition of right angle leverage and thus each provides an increasing mechanical advantage as the tension is increased. This arrangement permits the shaft **78** to maintain substantially constant tension though the tension applied to the drum head varies over a wide range.

Another important feature of the tympanum of the present invention is the ease with which it may be transported. The supporting legs **100** are telescoped within

bosses **102** provided on the base plate. A set screw **104** passes through each of the bosses and is adapted to engage the legs **100** to provide an adequate support for the tympanum. In packing the tympanum, the pressure of the screws **104** is merely relieved to permit the legs **100** to retract into the kettle **10**. They are held in this out-of-the-way position by again tightening the screws.

In regard to packing the tympanum, it should be noted that the handle knob **76** is readily removable from the shaft **78**. To facilitate this, the upper end of the shaft is formed with a plurality of flat faces **108** that are tapered in the direction of the upper end of the shaft. The recess **110** in the knob is provided with a plurality of mating flat faces so that when the knob is positioned on the shaft, the cooperating faces engage each other. With this arrangement the knob is freely removable but when in position engages the shaft to turn the same.

I claim:

1. In a drum including a casing supported in spaced relationship above a floor by a plurality of legs and having a central axis, and a drum head disposed perpendicularly to said axis, the combination with drum-head tensioning mechanism, including bell crank levers and adjusting devices engaged with the latter and the drum-head hoop, of radial tension rods connecting the bell crank levers with an axial tension rod disposed centrally of the drum casing and extending transversely of the drum head, said axial tension rod passing through an opening at the bottom of the drum, a housing including a mounting plate secured to the bottom of the casing for supporting said housing in spaced relationship above the floor, a leverage system mounted in the housing and comprising a pair of aligned bell cranks spaced from each other and connected by a link, one of the bell cranks of said leverage system being connected to said axial tension rod, and an operating mechanism having a single hand screw mounted on the casing adjacent the drum head, said screw being operatively connected to the other bell crank of said leverage system to move said axial tension rod toward and away from said drum head and cause said radial tension rods to expand and contract to actuate said first-named bell crank levers to apply equal tension on the drum head, the bell cranks of the leverage system being arranged to provide an increased mechanical advantage as the tension increases.

2. The arrangement claimed in claim 1, wherein the single hand screw is rotatably supported on the casing adjacent the drum head and actuates said operating mechanism through an intermediate member that is in threaded relationship with said screw and that is pivoted on said other bell crank.

3. The arrangement claimed in claim 1, wherein the single hand screw passes through a guide slot formed in a plate projecting laterally from said housing, said slot being aligned with the bell cranks of said leverage system.

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