April 4, 1950 W. F. LUDWIG 2,502,733

KETTLE DRUM AND TIMPANI THEREFOR

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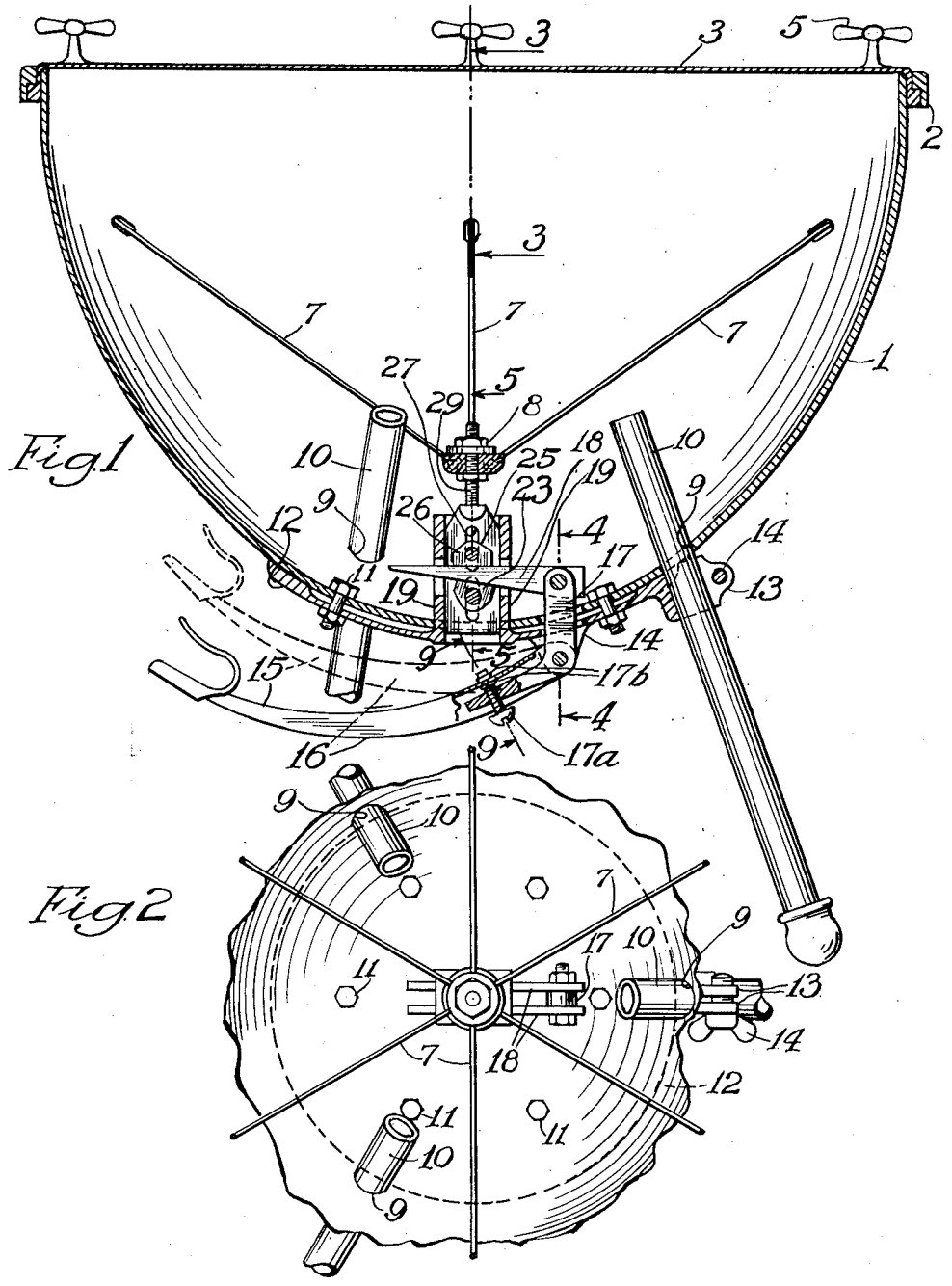


Fig 1

Fig 2

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Fig 3

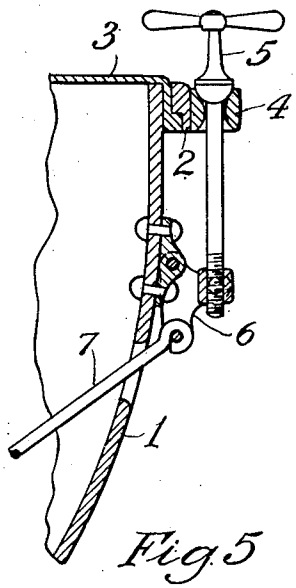


Fig 4

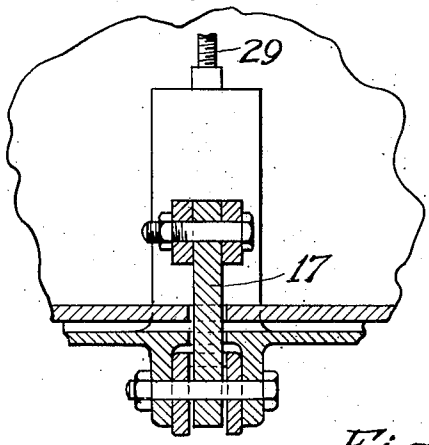


Fig 5

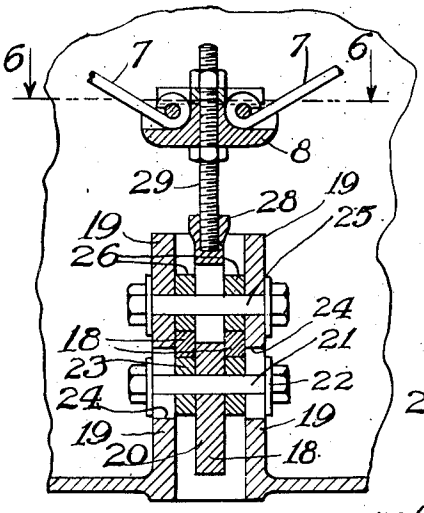


Fig 6

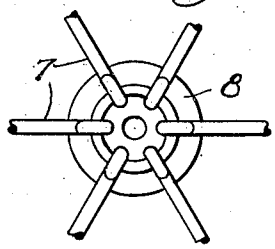


Fig 7

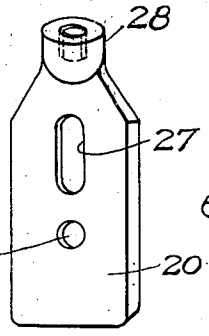


Fig 8

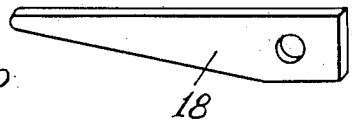
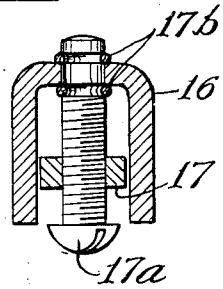


Fig 9



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Fig. 10

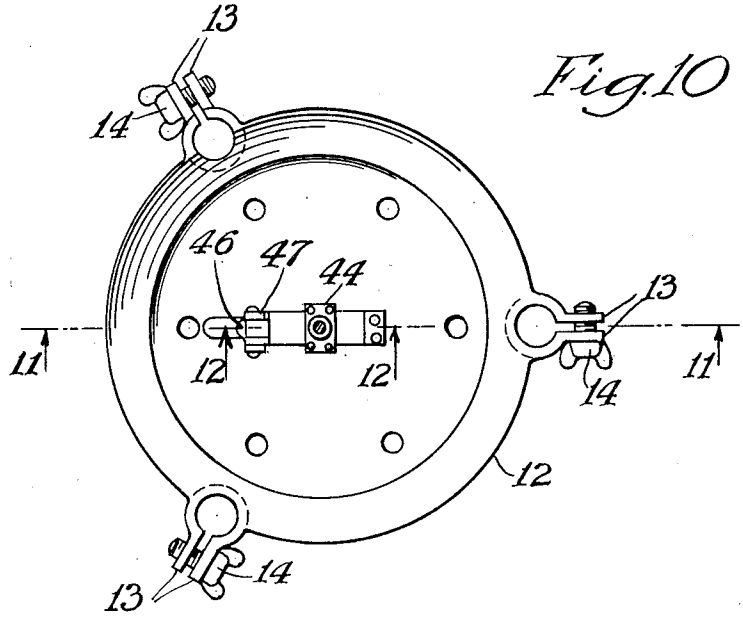
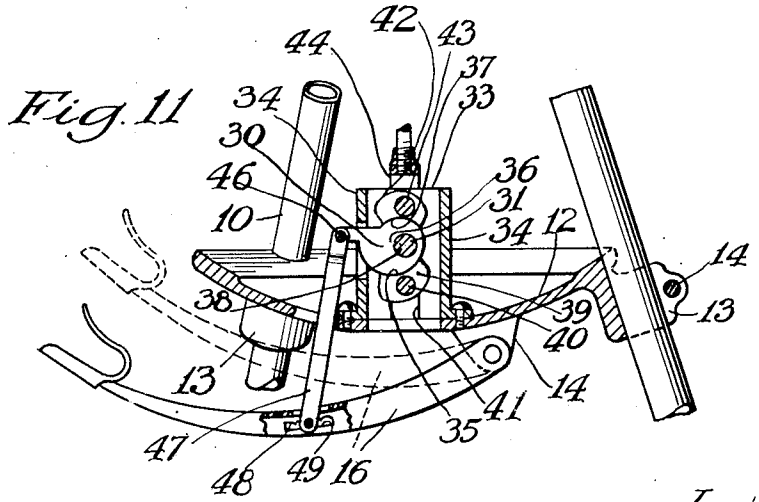


Fig. 11



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Fig. 12

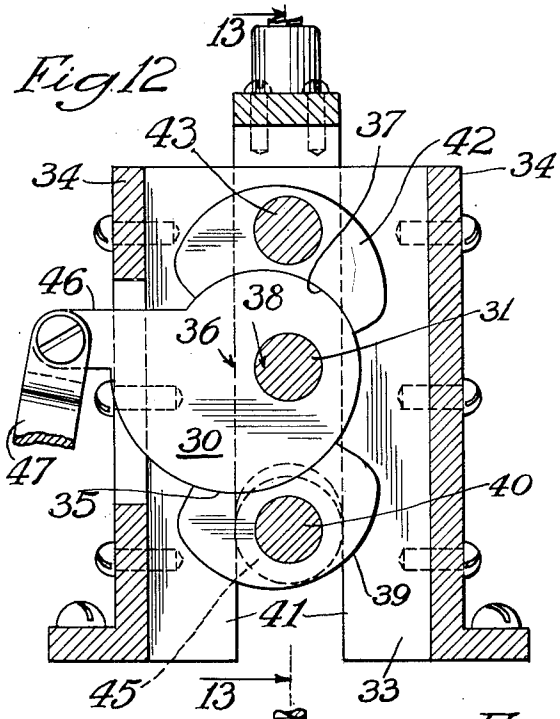


Fig. 13

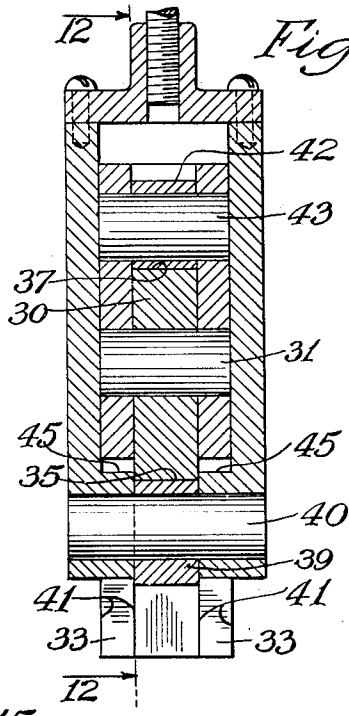


Fig. 14

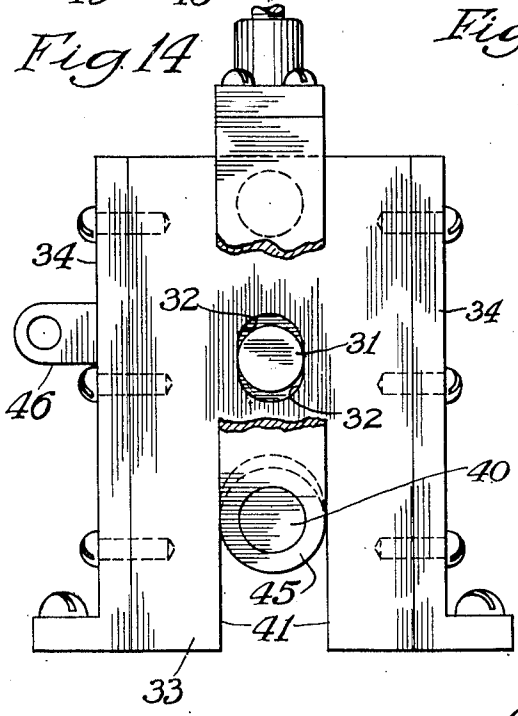


Fig. 15

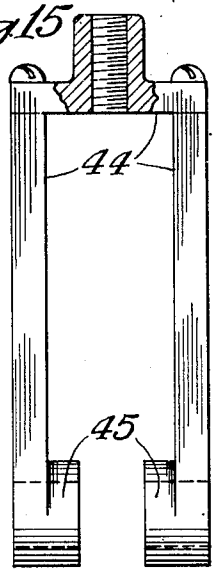
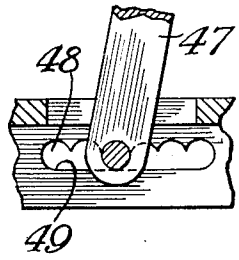


Fig. 16



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UNITED STATES PATENT OFFICE

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KETTLE DRUM AND TIMPANI THEREFOR

William F. Ludwig, Chicago, Ill.

Application August 30, 1946, Serial No. 694,007

1 Claim. (Cl. 84—419)

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This invention relates to improvements in kettle drums and tympani therefor and has for its main object to provide a kettle drum which is far lighter, far more compact and cheaper than other kettle drums and is, therefore, capable of being crated and shipped to purchasers at far less cost and is more easily capable of being transported from one location to another by the owner in an automobile or other passenger vehicle without being crated.

A further object of the invention is to provide a structure wherein the tympani is disposed entirely within the drum shell and the latter and the operating lever thereof, together with supporting legs, are mounted upon a plate removably secured to the bottom of the drum shell, the legs being capable of adjustment to project almost entirely into the drum shell preparatory to transport thereof to another location.

A further object of the invention is to provide an improved tympani for the drum.

In the accompanying drawings illustrating suitable embodiments of the invention:

Fig. 1 is a diametric sectional view of a drum constructed in accordance with the invention.

Fig. 2 is a plan sectional view of the same taken on the line 2—2 of Fig. 1.

Fig. 3 is a fragmentary detail radial sectional view, on an enlarged scale, showing one of the conventional drum head tension adjusting devices of the drum.

Fig. 4 is a fragmentary detail vertical sectional view, on an enlarged scale, taken on the line 4—4 of Fig. 1.

Fig. 5 is a fragmentary detail vertical sectional view, on an enlarged scale, taken on the line 5—5 of Fig. 1.

Fig. 6 is a detail plan view of the head with which the links, connected with the structure of Fig. 3, are connected at their inner ends.

Fig. 7 is a perspective view of the tympani plate connected with the head shown in Fig. 6.

Fig. 8 is a perspective view of a wedge member of the tympani.

Fig. 9 is a fragmentary detail sectional view, on an enlarged scale, taken on the line 6—6 of Fig. 1, showing means for adjusting a member connected with the foot lever of the structure.

Fig. 10 is a top plan view, on an enlarged scale, of the tympani supporting plate of the structure.

Fig. 11 is a vertical sectional view, on an enlarged scale, taken on the line 11—11 of Fig. 10, showing a modified form of tympani mechanism in side elevation.

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Fig. 12 is a vertical sectional view taken on the line 12—12 of Fig. 13.

Fig. 13 is a vertical sectional view taken on the line 13—13 of Fig. 12.

Fig. 14 is a side elevation of the structures shown in Figs. 12, 13 and 15, the yoke of the structure being partly broken away.

Fig. 15 is a view of the yoke of the structure of Figs. 1, 13 and 14, shown partly in section.

Fig. 16 is a fragmentary detail vertical longitudinal section view of a portion of the foot lever shown in Fig. 11.

The drum, as shown in Fig. 1, includes the kettle or shell 1, which is usually semi-spherical, but in the instance illustrated is of substantially the shape of the smaller end portion of an egg and, therefore, of greater depth proportionately to the diameter of its rim than is true of the conventional drum kettle.

The said kettle or shell 1 is equipped with the conventional hoop 2 to which the marginal portion of the drum head 3 is secured, the latter being equipped with conventional projections 4 (Fig. 3) equipped with openings constituting bearings for the shanks of the screws 5. Threaded end portions of the said shanks are engaged in a conventional manner with the elbow portions of bell crank levers 6 secured pivotally at one end to the shell 1 and connected at their other ends with the outer ends of links 7 which project through openings in said shell 1 and are connected at their inner ends with the head 8 (Figs. 6 and 7) of the tympani of the drum, as described hereinafter.

The above described structures of Fig. 3 are usually six or eight in number and are equally spaced apart.

The said shell 1 is equipped at bottom with a central opening, and at three equally spaced apart points, which are also spaced equi-distantly from the axis of said shell 1, with openings 9 through which the supporting legs 10 of the structure project, said openings 9 being disposed in staggered relation to the said links 7.

Inwardly of the openings 9, the shell 1 is equipped, in the instance illustrated, with a series of six equally spaced apart openings 11, also spaced equi-distantly from the axis of the shell, and three which are aligned radially with the openings 9, for the passage of bolts which secure the dished plate 12 to said shell 1, said plate being shown in top plan view in Fig. 13.

Said plate 12 is equipped at three equally spaced apart marginal points with contractible conventional sleeve formations 13 through which the

tubular supporting legs 10 pass and wherein they are clamped against movement by operation of the sleeve contracting screws 14.

Said plate 12 is equipped on its lower face with a pair of parallel projections 15, aligned radially with the axis of one of the said sleeve formations 13, between which one end of the foot lever 16 is secured pivotally.

The said foot lever 16 is channeled to receive one arm of the bell crank lever 17 which also is pivotally connected with said projections 15. The other arm of said lever projects into the said shell 1 of the drum and is rendered adjustable relative to the lever 16 by means of a set screw 17*a* which engages in a threaded opening in the lower arm of the bell crank lever 17 and has one end portion projecting freely through an opening in the web of said lever 16, said end portion of said set screw being equipped with annular grooves in which split wire collars 17*b* are engaged to hold said screw against longitudinal movement.

Secured pivotally at one end to the said inner arm of said lever 17 is a pair of parallel wedge members 18, of the preferred form of tympani of the drum, one wedge member 18 being shown in Fig. 7.

The said tympani includes a pair of parallel flat vertical plates 19 (Fig. 5) which may be integral with or suitably secured rigidly to the plate 12. Disposed midway between said plates 19 is a flat plunger 20 (Fig. 8) equipped in its lower end portion with an opening 21 constituting a bearing for a shaft 22, which carries a pair of shoes 23, disposed upon opposite sides of said plunger 20.

Said shoes 23 are equipped with flat upper faces which bear upon the lower faces of the wedge members 18, the said shaft 22 being secured to said shoes midway between the ends thereof (Fig. 1).

The outer end portions of said shaft 22 pass through vertical slots 24, of width equal to the diameter of said shaft, in the said plates 19.

A similar shaft 25 which carries a similar pair of shoes 26, bearing upon the upper surfaces of said wedge members 18, is journalled at its ends in the side plates 19. The said shaft 25 passes through the longitudinal slot 27 of the said plunger 20.

Said plunger 20 is equipped at its upper end with a boss 28 equipped with a threaded opening to receive the lower end portion of a threaded link 29 rotatably associated with the said head 8 against longitudinal movement relative to the latter.

Thus when the foot lever 16 is depressed, the wedge members 18 are moved inwardly relative to the shoes 23 and 26 and thus the plunger 20 and head 8 are moved downwardly and thereby cause the links 7 to turn the bell crank levers 6 and draw the hoop 2 downwardly to tension the drum head 3 to a degree determined by the extent to which the foot lever is depressed.

It will be noted that the long arm of the foot lever 16 is curved so that when swung upwardly to the dotted line position of Fig. 1, it will be disposed closely adjacent to the shell 1, this being its position when the structure is crated for shipment. The legs 10 are then positioned relative to the bottom wall of the crate so that the lowest point of the lowest projection of the plate 12 will be spaced from said bottom wall of the crate.

The above described tympani structure is very simple, but because of high tension stress that must be overcome thereby, and the requirement that when the drum head 3 is under any degree, and particularly under its maximum degree of tension, and the operator's foot is withdrawn from the foot lever 16, the said lever must remain in the position to which it has been moved, the angle of divergence of the upper and lower surfaces of the wedge members 18 from each other, may not be more than seven degrees, the swing of said lever 16 and the corresponding length of stroke of the wedge members 18 is required to be relatively long to cover a full octave range of tone of the drum.

The said wedge surfaces and those of the shoes 23 and 26 opposed thereto are required to be very accurately plane and smooth and maintained lubricated sufficiently to avoid squeak or chattering during operations of said foot lever 16.

Obviously the muscles of the operator's leg used may not be maintained tense due to the requirement that the position of the lever 16 must be maintained at any given position against any movement up or down from said position while the tone of the drum required needs to be maintained during any time period short or long without fatiguing said muscles.

Therefore, when said lever 16 has been depressed or raised to any level, the operator's muscles should be capable of being relaxed while the foot rests upon said lever. The resistance to movements of the latter must be such as to render the same capable of bearing the weight thus imposed upon it without effecting further depression of said lever and, also, preferably, without requiring any muscular action to retain said lever in that position. To raise the lever from any level to a higher one should also require a slight muscular effort of the operator.

Because of these requirements, or, at least highly desirable results to be attained, the frictional resistance to self-restoration of the drum head 3 to low tension and the sustaining of the weight imposed upon the lever 16 when muscles are relaxed as aforesaid, and it being obvious that said weight varies proportionately to the weight of the operator, the accuracy of shape and the areas of the opposed surfaces of the said wedge members and shoes is required to be of a relatively high precision type.

If the angle of divergence of the said wedge surfaces is reduced, the length of stroke of the wedge members must be increased proportionately thereto to effect the same length of stroke of the plunger 20 of the structure and a correspondingly longer arc of swing of the foot lever 16, a longer stroke being undesirable.

Adjustment of the bell crank lever 17 relative to the foot lever 16 operates to correct all possibility of having the lever 16 bear upon the floor before maximum tension of the drum head 2 has been attained.

The upper and lower surfaces of the wedge members 18 is limited, preferably, to an angle of no more than seven degrees to overcome their reverse movement responsively to the tension stress imposed upon the lower shoes 23 and consequent requirement that the operator maintain pressure upon the foot lever 16 to maintain said head 2 tuned to the desired note or tone, it being obvious that this pressure requirement increases progressively as the foot lever is lowered.

The above described structure meets all of the said requirements as nearly perfectly as highly skilled workmanship permits.

The structure illustrated in and by Figs. 10, 11 and 12 constitutes a substitute for the tympani structure described hereinabove.

As shown in Fig. 11, said structure comprises the cam member 30 rigid with the shaft or trunnions 31. As shown in Figs. 12 and 13, said shaft or trunnions 31 engage in short vertical slots 32 in the side plates 33 of a casing which includes end plates 34 secured to the plate 12.

The said cam member 30 comprises a lower arcuately surface portion 35 which is eccentric to its axis of rotation, the center of said eccentric surface 35 being at the point 36 and aligned horizontally with the axis of the cam member 30. Said surface 35 is semi-circular.

Above the normally horizontal plane of the axis of said member 30 and its surface 35, is another arcuate surfaced cam portion, the arcuate surface 37 of which has its axis disposed in said horizontal plane at a point 38 between the axis of the cam surface 35 and the axis of the member 30, the spacing of said point 38 from the axis of the member 30 being subject to variation to increase or decrease the degree of eccentricity of the surface 37 to the axis of the member 30.

A shoe 39 of shape similar to a brake shoe of a railway car wheel and having an arcuate surface of radius equal to that of the surface 35, and opposed to the latter, is equipped with a shaft or trunnions 40, which project through the vertical slots 41 in the side plates 33 of the casing, the axis of said shaft or trunnions 40 lying in the vertical plane of the axis of the member 30.

Another shoe 42, similar to the shoe 39, the shaft or trunnions 43 of which are journalled in said side plates 33 in vertical alignment with the trunnions 40 and the axis of the member 30, is opposed to the arcuate surface 37 of the member 30.

A yoke 44 equipped with bearings 45 for the trunnions 40, and which project through the slots 41 of said side plates 33, connects the trunnions 40 with the tension link 29 and thus with the head 8 to which the tensioning links 7 are secured.

As the centers of the arcuate surfaces 35 and 37 are both disposed to the left of the axis of the member 30, it follows, obviously, that the stress exerted by the shoe 39 upon the arcuate surface 35 causes the shoe 39 to be moved downwardly and the cam member 30 to be forced upwardly so that the cam surface 37 bears with equal pressure upon the opposed surfaces of the shoes 39 and 42, and thus both said shoes 39 and 42 tend to turn member 30 in respectively opposite directions responsively to the tension stress applied to the shoe 39, but with respectively different degrees of force proportionately to the difference in degree of eccentricity of the surfaces 34 and 37, respectively, to the axis of the cam member 30.

The latter is equipped with the projection 46 which is connected by means of the link 47 with the foot lever 16, the last-named connection being rendered adjustable along said lever in any suitable manner as exemplified in Fig. 15.

As the lever 16 is depressed, the cam member 30 will be rotated anti-clockwise through a length of arc determined by the distance between the pivotal axis of said lever 16 and the axis of its pivotal connection with the said link 47.

The shoe 39 is thus forced downwardly a distance far greater than the cam member 30 is forced upwardly, both shoes 39 and 42 being turned slightly on their pivotal axes in respectively opposite directions during this movement of said cam member 30, but not equally so. During this movement, the axis of the cam member 30 will approach that of the shoe 42 slightly while the axis of shoe 39 will become spaced progressively farther from the cam axis.

For example, if the arc of rotation of the lever 16 is fixed at thirty degrees to cover the entire tone range of the drum covering one octave, and this requires the shoe 39 to be moved downwardly a distance of three-sixteenths of an inch during said swing of the lever 16, then the eccentricity of the cam surface 35 to the cam axis may be of such degree as to cause the shoe 39 to move downwardly one-quarter inch while the cam 30 moves upwardly only one-sixteenth of an inch as determined by the degree of eccentricity of the respective cam surfaces 35 and 37 to the cam axis.

The shoe 42 acts more particularly as a brake shoe, the efficiency of which is increased by reason of the pressure exerted thereby upon the cam 30 counter to the pressure exerted thereupon by the shoe 39.

In both the tympani structures shown and described, the upper shoes operate as brake members, but in the last described structure the arcuate surfaces of the shoes are of greater length with respect to the length of the shoes than is true of the shoes of the first described structure.

The cam member 30 and shoes 39 and 42 may be composed of laminated sheet metal plates wherein steel and bronze plates are alternated in such manner that each bronze plate of the cam member 30 is opposed to steel plates of the shoes 39 and 42.

Obviously, in both the tympani structures, the upper and lower shoes are forced apart by wedge action.

As shown in Fig. 14, the lower end of the link 47 may be connected pivotally with the foot lever 16 at any one of a plurality of spaced apart points consisting of a series of arcuate recesses 48 in the upper walls of longitudinal slots 49 in the flanges of said lever 16.

I claim as my invention:

In a conventional kettle drum, a dished plate shaped to fit the central bottom portion of said drum and removably secured thereto and equipped marginally with contractible clamping sleeves aligned axially with openings in the drum shell, drum supporting legs projecting telescopically through said sleeves, a tympani comprising an inverted V-shaped frame rigidly mounted upon the upper concave face of said plate and projecting into the drum shell, a brake shoe mounted pivotally upon the side plates of said frame in the upper portion of the latter and equipped with a lower arcuate face, a vertically reciprocable member mounted for vertical movement in the lower end portion of said frame and connected at its upper end with the links connected with the drum head tensioning hoop, vertical guide formations in the arms of said frame, a lower shoe mounted pivotally in said reciprocable member in alignment with said upper shoe and having an upper arcuate face, a rocking cam member interposed between said shoes and equipped with arcuate faces corresponding in radius respectively with the faces of said shoes, the lower shoe engaging face of said cam member being eccentric to its pivotal axis to effect movement of said reciprocable member when rotated, said cam member equipped with a peripheral projection between said respective arcuate faces thereof, a foot lever pivotally connected at one end with the bottom portion of said plate

at a point spaced from the center thereof and arranged to swing in a diametric plane of the drum axis, and a link connecting said cam member projection and said lever at a point spaced from the plate center at the opposite side of the said center from which the pivot of said foot lever is spaced.

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The following references are of record in the file of this patent:

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