Dec. 21, 1937. H. K. PATJENS 2,103,172

ARTICULATED LOCOMOTIVE

Filed April 25, 1936 3 Sheets-Sheet 1

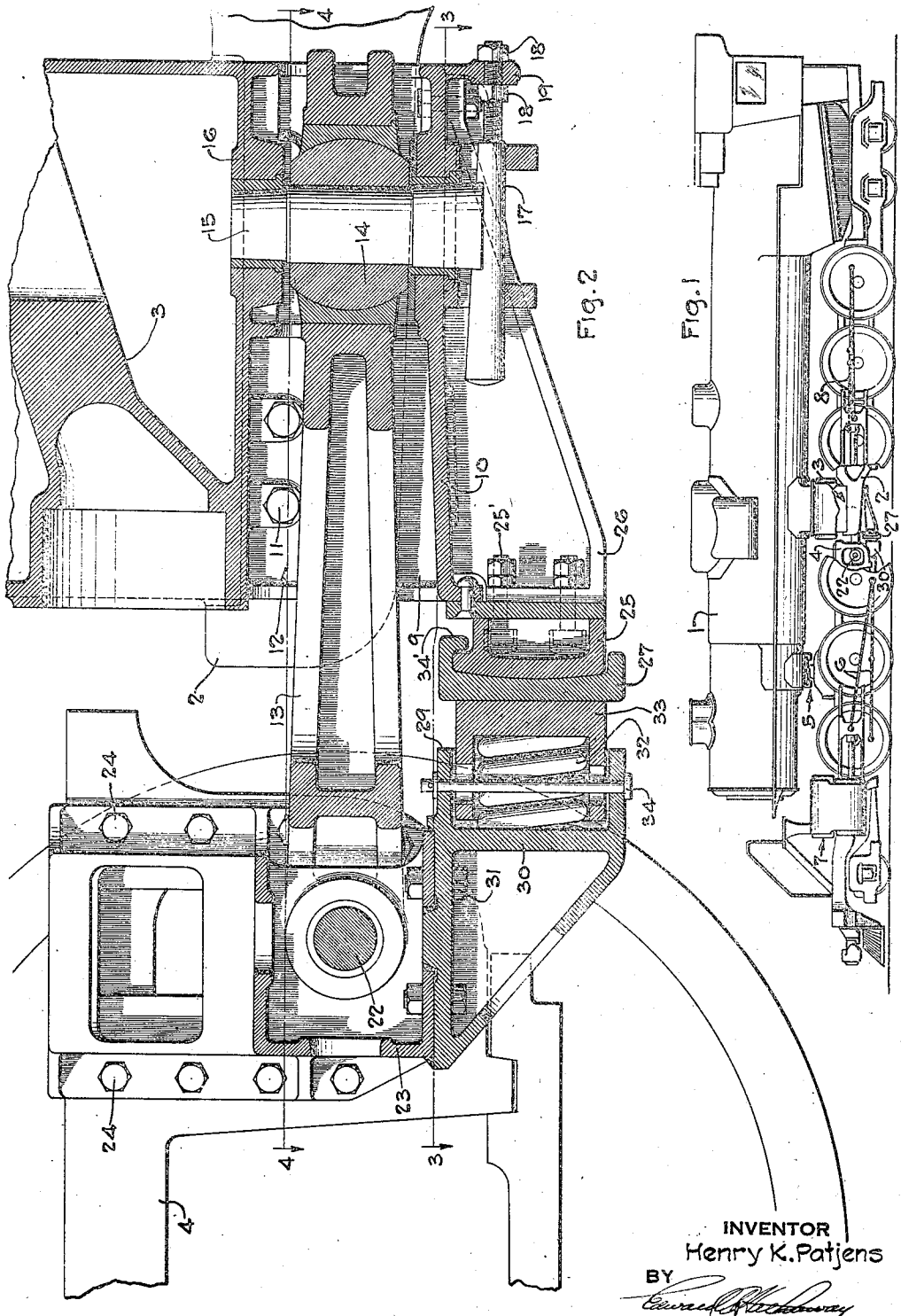


Fig. 2

Fig. 1

INVENTOR
Henry K. Patjens
BY
ATTORNEY

Dec. 21, 1937. H. K. PATJENS 2,103,172

ARTICULATED LOCOMOTIVE

Filed April 25, 1936 3 Sheets-Sheet 2

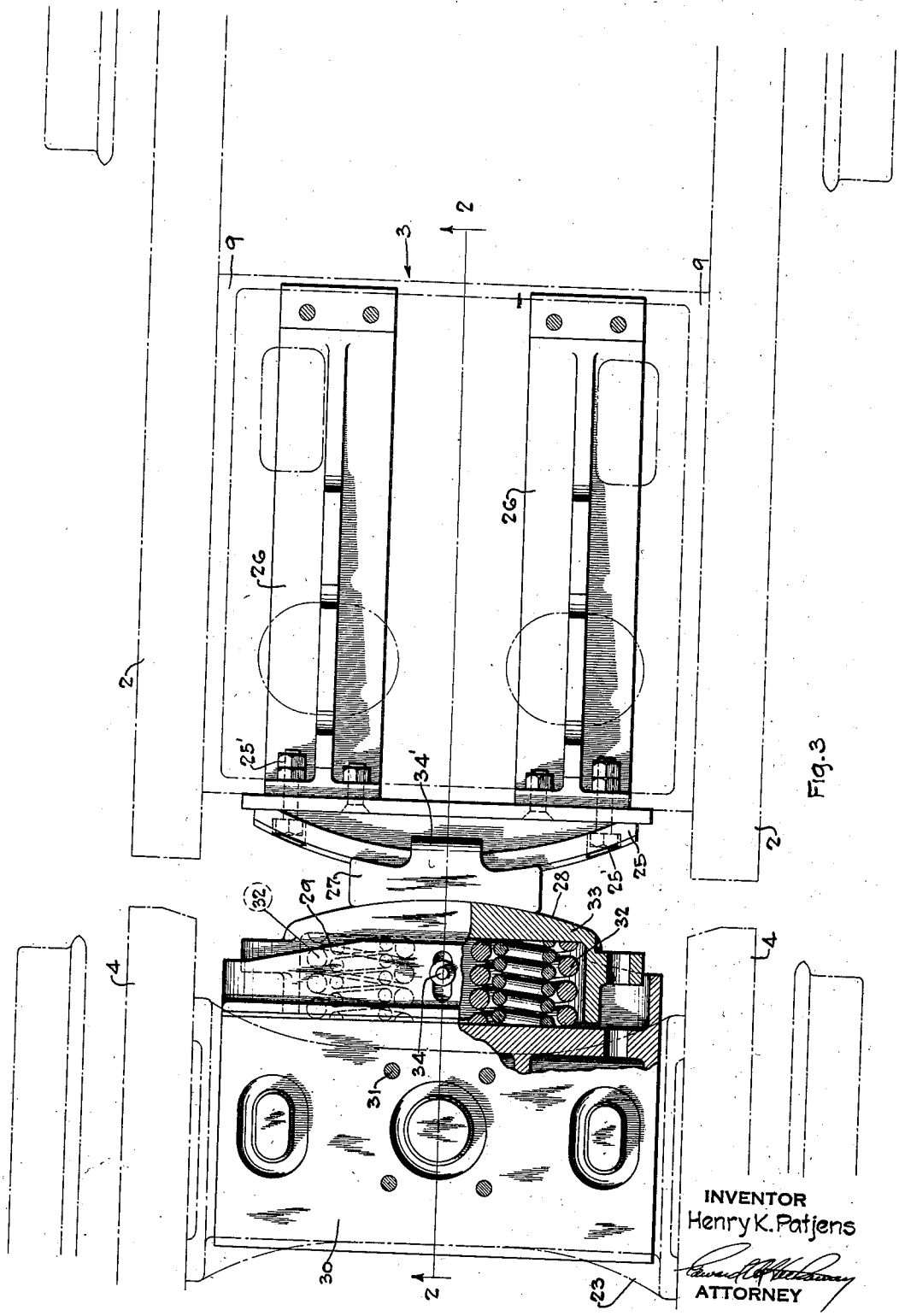


Fig. 3

INVENTOR
Henry K. Patjens

ATTORNEY

Dec. 21, 1937. H. K. PATJENS 2,103,172

ARTICULATED LOCOMOTIVE

Filed April 25, 1936 3 Sheets-Sheet 3

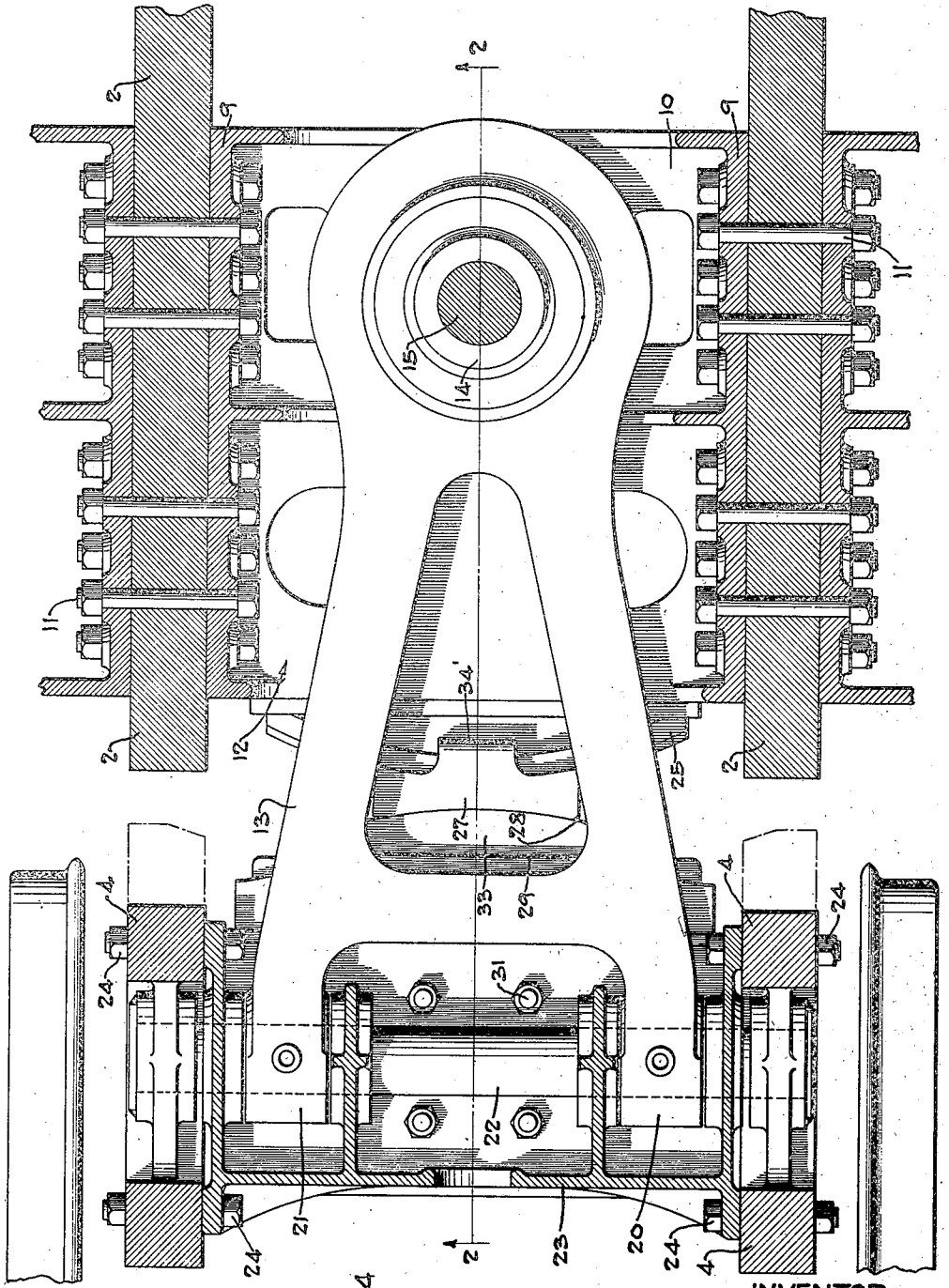


Fig. 4

INVENTOR
BY Henry K. Patjens
ATTORNEY

Patented Dec. 21, 1937 2,103,172

UNITED STATES PATENT OFFICE

2,103,172

ARTICULATED LOCOMOTIVE

Henry K. Patjens, Yeadon, Pa.

Application April 25, 1936, Serial No. 76,455

4 Claims. (Cl. 105—175)

This invention relates generally to an articulated type locomotive commonly referred to as a Mallet locomotive and relates more particularly to an improved combination of connecting elements between the articulated frames to insure maximum stability of operation through a wide range of speeds.

A great many arrangements have heretofore been proposed and used for connecting together the articulated frames of Mallet locomotives in order to unify the action of the articulated driving units. Certain of these arrangements have included pivotal connections of various types between the two frames while other arrangements have included springs for taking up slack and wear in such pivotal connections in order to maintain the articulated units in as near rigid relation as possible in the belief that greater stability of operation of the two units could be obtained. These prior arrangements were nevertheless deficient in effecting maximum cooperation between the articulated driving units with the result that more satisfactory means have always been desirable.

The difficulties incident to articulated locomotives is especially aggravated by a combination of dynamic forces of reciprocating masses of the respective units together with the power impulses which may occur in a highly variable sequence in the respective units due to slippage of the wheels of one unit or the other. The problem is rendered even more difficult due not only to the absolute necessity for maintaining a high degree of flexibility between the articulated units to permit smooth turning around curves but also to the necessity for having the forward unit arranged to flexibly laterally support the boiler while the back unit is inflexibly laterally connected thereto. The explanation for the deficiencies in the many prior art arrangements is believed to be found in their inability to overcome with a high degree of satisfaction the complexities resulting from the combination of the masses involved, the power impulses, the dynamic forces, the indeterminate sequence with which the dynamic forces and power impulses will occur and the necessity for maximum flexibility of the units with respect to each other together with the flexibility of one unit and the inflexibility of the other unit relative to the boiler.

It is an object of my invention to provide an improved combination of elements that will minimize the possibility of instability resulting from the variable forces and conditions above outlined. A further object is to provide such an improved combination that is relatively simple considering its purpose and function, and is economical in manufacture and maintenance and readily accessible for inspection and repair without unnecessarily restricting or limiting the cooperation between the elements.

Other objects and advantages will be more apparent to those skilled in the art from the following description of the accompanying drawings in which:

Fig. 1 is a side elevation of an articulated type locomotive, parts of which are broken away to show the location of my improved connecting means;

Fig. 2 is a vertical longitudinal section taken substantially on the line 2—2 of Figs. 3 and 4;

Fig. 3 is a horizontal section taken substantially on the line 3—3 of Fig. 2;

Fig. 4 is a horizontal section taken substantially on the line 4—4 of Fig. 2.

In the specific aspect of the invention illustrated herein, I have shown a conventional type articulated locomotive provided with a boiler 1, a back driving unit having a frame 2 supported in laterally fixed relation to the boiler and terminating in a cylinder saddle generally indicated at 3. A front driving unit includes a frame 4 adapted to flexibly support the forward end of the boiler through a usual waist bearer and crosstie generally indicated at 5 which permits relative lateral movement between the front unit and boiler as well as relative rocking movement therebetween. The driving rod and connecting rods generally indicated at 6 are connected to the front engine piston and cylinder 7 which is also rigidly mounted on the front frame 4. The driving rod and connecting rods for the rear driving wheels are generally indicated at 8. It will of course be understood that usual driving springs and spring equalizing mechanism are employed together with other usual structural elements of the respective driving units, although it is not necessary to describe the same here as they do not form any part of the present invention.

As is shown more clearly in Fig. 2, the cylinder saddle 3 has side walls 9 and a bottom wall 10 depending between the side members of frame 2 and bolted at 11, Fig. 4, or otherwise suitably secured to or formed therewith, thereby forming a longitudinal opening 12. A triangular shaped Mallet connecting bar 13 has one end received within opening 12 for universal swivelling connection to the back frame through a ball and socket joint 14 which is supported upon a ver-

tical pin 15. This pin is suitably supported in the lower wall 10 and upper wall 16 of the cylinder saddle and is held in position by any suitable or usual means such as a longitudinally adjustable wedge 17. This wedge is provided with a threaded stem held in position by nuts 18 on opposite sides of a lug 19 which is formed integrally with the frame. The forward end of the connecting bar 13 is supported through bearings 20 and 21 to permit only vertical pivotal movement on a transverse shaft 22. This shaft is supported in a suitable rear crosstie 23 bolted or otherwise suitably secured to the front frame 4 by bolts 24. This type of Mallet connecting bar per se is well known and heretofore it has been believed that any instability of operation of an articulated locomotive was due solely to slack in the bearings at either end of the link caused by wear. It was attempted to overcome the difficulties incident to such wear by providing buffer springs, but in the light of my present invention it will be seen that the problem is not one of merely overcoming lost motion in the pivotal connections.

In my present invention I employ the foregoing type of Mallet bar in combination with means adapted to produce frictional forces that are yieldable both vertically and laterally thereby to cause the connecting bar to maintain the articulated frames in positive longitudinal relation and at the same time permit complete, but frictionally resisted, relative vertical movement between the frames. As a result of my improved combination, individual effects of the variable sequence of power impulses and dynamic forces of the respective units will at all times be maintained in full cooperative relation tending either to balance out each other or to produce a minimum resultant effect regardless of whether the forces emanating from each of the power units are vertical, lateral or longitudinal, this combination having the further advantage of obtaining the usual desirable results of the combined mass action of an entire locomotive. Hence it is possible with my improved combination to obtain not only the results heretofore accomplished but also to obtain additional cooperative results.

To the foregoing end, I have provided as shown in Fig. 2 a transversely disposed arcuate trackway 25 bolted at 25', Fig. 3, and projecting forwardly from the lowermost portion 26 of the cylinder saddle 3. A wear plate 27 provided with concave front and back surfaces in plan view, Fig. 4, is interposed between the face of trackway 25 and a horizontally curved surface 28 formed on a member which is receivable in a suitable socket 29 of a member 30. This member 30 is bolted as at 31 or otherwise suitably secured to the under side of the rear crosstie 23 of the front power frame. Any number of suitable springs 32 preferably coiled are interposed between the member 30 and a transverse wall of the longitudinally yieldable pressed member 33. Pins 34 or other suitable means may extend through slots in member 33 to limit maximum outward movement thereof. This device per se is of course old and well known, and hence its details of construction do not need to be further described other than to point out that the wear plate 27 is provided with a suitable lip 34' overhanging a flange of trackway 25 to suitably guide the wear plate around the trackway and maintain the wear plate in operative relation to the friction surface 28 during relative lateral motion between the articulated frames while at the same time permitting relative vertical movement between the contacting frictional surfaces of members 27 and 33 regardless of the relative lateral position between the frames.

Hence it is seen that the two power units of the articulated locomotive are adapted to have maximum flexibility in both lateral and vertical directions while at the same time providing a high degree of frictional resistance to vertical movement of the two frames relative to each other, thereby minimizing the unstable effects of vertical dynamic forces in the two units, this being in combination with the simultaneous action of the springs 32 in not only creating the frictional resistance but in also maintaining the front and rear frames in complete positive articulated relation without relative longitudinal movement therebetween. This provides the necessary reactive forces to the frictional producing force of springs 32 during all vertical and lateral relative movements between the power units of the locomotive. Thus it is seen that the various elements have been brought into such cooperative relation as to produce a locomotive that is highly effective in insuring maximum stability and flexibility of operation with minimum necessity for inspection and repair but nevertheless readily accessible at any time.

It will of course be understood that various changes in details of construction and arrangement of parts may be made by those skilled in the art without departing from the spirit of the invention as set forth in the appended claims.

I claim:

1. An articulated "Mallet" type locomotive having front and back frames with individual power producing mechanism comprising, in combination, means for pivotally connecting said power frames together in positive relation but adapted to allow vertical and lateral relative movement therebetween, elements having opposed surfaces adapted for vertical and lateral slidable contact with each other, spring means for pressing said surfaces into frictional contact with each other, and means connecting said elements respectively to said frames so that said vertical and lateral movement is transmitted from the frames to said surfaces without such movement being transmitted through said spring means.

2. The combination set forth in claim 1 further characterized in that said spring means comprises a longitudinally acting spring for creating said vertical and lateral resisting friction and simultaneously tending to separate said locomotive frames to firmly maintain the pivotal connections between said frames.

3. An articulated "Mallet" type locomotive having front and back frames with individual power producing mechanism comprising, in combination, means for pivotally connecting said power frames together in positive relation but adapted to allow vertical and lateral relative movement therebetween, and means for frictionally resisting said lateral and vertical relative movement including members carried by the respective articulated frames and provided with convex opposed surfaces in plan view, a wear plate interposed between said surfaces and having concave surfaces mating with said opposed surfaces and one set of said mating surfaces being adapted for vertical relative movement, and yieldable means for pressing all of said surfaces into frictional contact with each other, whereby any vertical or lateral movement be-

tween said frames or vertical dynamic forces created by the driving mechanisms thereof will be resisted by the joint action of said frames through said frictional contact.

4. The combination set forth in claim 1 further characterized in that said means for pivotally connecting said frames includes a bar which is of triangular shape in plan view and has its apex swivelly connected to one frame and its base only transversely pivotally connected to the other frame.

HENRY K. PATJENS.