

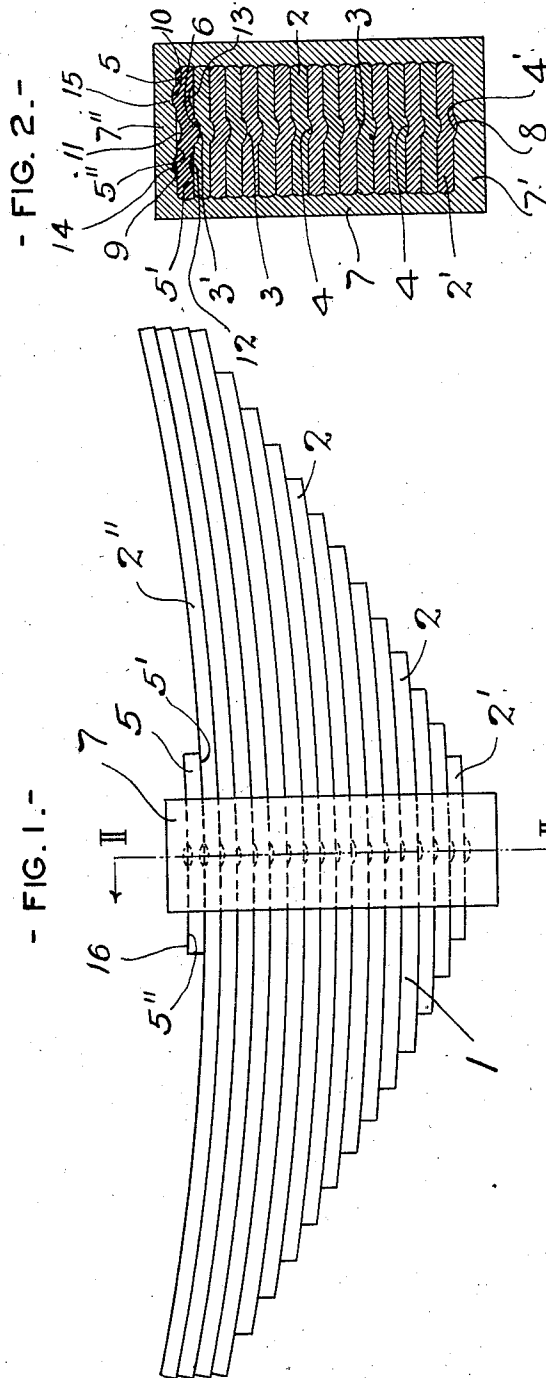
Dec. 31, 1935.

A. K. STRANDBERG ET AL

2,026,404

LAMINATED SPRING

Filed April 9, 1935



INVENTORS
Albin K. Strandberg
Theodore R. Weber
Charles M. Ipsen

BY *S. C. Yeaton*
ATTORNEY

UNITED STATES PATENT OFFICE

2,026,404

LAMINATED SPRING

Albin K. Strandberg, Theodore R. Weber, and
Charles M. Ipsen, Latrobe, Pa., assignors to
American Locomotive Company, New York,
N. Y., a corporation of New York

Application April 9, 1935, Serial No. 15,412

5 Claims. (Cl. 267—53)

This invention relates to laminated springs, especially the so-called elliptic and semi-elliptic springs composed of a plurality of superposed leaves or plates extensively employed in railway vehicles, such for instance as locomotives.

A common type of such a spring comprises a set of superposed interlocked spring plates held together by a band between which and one of the outermost spring plates a coupling plate is employed that functions to hold the said outermost spring plate and consequently the entire set of spring plates in locked engagement with the band at its portion adjacent the coupling plate.

The object of this invention is to provide simplified means for effecting the permanent locking of the band and the coupling plate together.

In the accompanying drawing forming part of this specification Fig. 1 is a side elevation of a spring embodying the present invention and Fig. 2 is a section taken on the line II—II of Fig. 1.

Referring more particularly to the drawing which exemplifies a preferred embodiment of the invention, the spring here shown, indicated generally by the numeral 1, is of the so-called semi-elliptic type. It is obvious however that the invention is not limited to any one type of spring for its application is contemplated to any type of laminated leaf or plate spring where the leaves or plates are tightly held together by a band. In the present instance the spring 1 is comprised of a set of spring plates indicated generally by the numeral 2 having as one of its outermost plates the plate 2' and as the other of its outermost plates the plate 2'', the plate 2', according to usual practice, being the shortest and the plate 2'' being one of the longest of the plates and the intervening plates each increasing in length from the plate 2' to the plate 2'', except that plate 2'' and the three adjacent plates are of equal size. Each of the plates is subjected to the action of a pressing machine, or is otherwise treated, to form therein at its center a depression 3 on one of its faces, and on its face opposite the depression a projection 4.

The depressions are formed on the corresponding faces of all of the plates and likewise the projections are formed on the corresponding faces of all of the plates. In the present instance the plates are shown slightly curved and the depressions are formed on the concave faces and the projections on the convex faces of the respective plates. Each projection extends or fits into the depression opposite it in the adjacent plate and the plates are all interlocked thereby

one with the other, the outermost plate 2' having at its outer face its projection indicated as 4' and the other outermost plate 2'', commonly termed the main plate, having at its outer face its depression indicated as 3'.

A coupling plate 5 directly contacts at its inner face 5' with the outer face of the main plate 2'' and is formed with a projection 6, preferably in a manner similar to the formation of the projections 4, which engages or fits into the depression 3'.

A band 7 encompasses all of the plates and is provided at its end portion 7' adjacent the plate 2' with a depression 8 formed in its inner face into which fits the projection 4'.

The construction of the spring as thus far described provides for the interlocking of each of the spring plates with its adjacent plate or plates, also for the interlocking of the spring plate 2' with the adjacent portion 7' of the band 7, and also the interlocking of the coupling plate 5 with the main spring plate 2''. This construction, as thus far set forth, forms no novel part of the present invention, being present in old constructions, see for instance the patent to Ludlum, 458,705.

Formerly it was a common practice to construct this general type of spring without employment of any coupling plate, and a type of such construction is shown in the patent to Batz, 1,610,732. Such a construction provides for securing the spring plates together and in the case of relatively small sizes of springs may give a fair degree of satisfaction but with the larger sizes of springs which are now commonly employed with the modern, large, high speed locomotives this means of securing the spring plates together has proven inadequate and sooner or later the plates became loose within the encompassing band.

It was found that the employment of a coupling plate was a material improvement, but as far as it is known such a coupling plate has never been in direct contact with nor directly and permanently locked with the encompassing band. In other words there has always been a space between the band and the coupling plate, and in this space a temporary locking member has been provided, such for instance as the member (set screw) employed in the above mentioned Ludlum patent, or the filler member of the patent to Sieprath, 1,852,132, or the wedges of the patent to Waterhouse, 1,352,488. Such constructions are of course complex whereas simplicity should be of primary importance. Moreover they present

constructions in which the locking of the coupling plates to the bands is not permanent; the extra locking members between the band and the coupling plate are furthermore likely to become loosened and thereby prove unsatisfactory; and what is more, and in many cases of considerable importance, such constructions provide springs requiring more vertical space (where often this space is necessarily limited) for their installations.

The present invention, while employing a coupling plate, does away entirely with the necessity for any locking member between the coupling plate and the band. It thereby materially simplifies the construction, and at the same time more surely and permanently locks the parts together, and further minimizes the necessary space (vertical space) for the installation of the spring.

In the preferred embodiment the coupling plate 5 is provided with two projections 9 and 10 extending outwardly beyond the outer face 5" of said plate 5 at the transverse center line of the plate and at either side of the longitudinal center line, that is to say, at either side of the depression 11 which resulted from the formation of the projection 6. These projections 9 and 10 are preferably formed by the same method employed in forming the other projections which accordingly results in the formation of corresponding depressions 12 and 13. In the portion 7" of the band 7 which contacts directly with the coupling plate 5 are formed two depressions 14 and 15, similar to the depression 8, into which depressions 14 and 15 fit respectively the projections 9 and 10. The coupling plate 5 may extend at each of its ends to any desired extent beyond the band to thereby increase its frictional contact with the main plate 2", such projections being shown at 16 at each side of the band 7.

In many constructions, such as those in the patents above referred to, the band is made in one piece and in such constructions as that of the Batz Patent 1,610,732 is suitably made of wrought iron, is heated, then slipped over to encompass the set of interlocked spring plates at the longitudinal center of the spring and there fixed in position by the application thereto of hydraulic pressure whereby all the plates are tightly pressed one against the other and interlocked in permanent fixed positions. This method of securing the band admirably lends itself to the present invention and in the preferred embodiment is availed of, thereby providing a spring of the coupling plate type wherein the coupling plate and the encompassing band are in direct contact and directly and permanently interlock one with the other.

While but one coupling plate is shown, as this is all that is usually necessary, it is obvious that a coupling plate may be employed at each of the opposite ends of the set of spring plates. Furthermore in the present embodiment the projections and depressions on the spring plates may be reversed in position, as desired, in which case a projection would be formed on the band portion 7' instead of the depression 8, and a depression would be formed on the coupling plate 5 instead of the projection 6. Furthermore the depressions 14 and 15 and their respective interfitting projections 9 and 10 may be reversed, in which case depressions will be formed on the coupling plate 5 instead of the projections 9 and 10 and projections will be formed on the portion 7" of the band 7 instead of the depressions 14 and 15. However

such suggested modifications lack the simplicity of the construction shown, for it is easier to form the depressions in the portions 7' and 7" than projections. Furthermore to change the projections of the coupling plate 5 into depressions would result in creating projections on the face opposite the face containing the depressions if the proposed modified method of forming the depressions were resorted to, and these projections thus formed would have to be removed or corresponding depressions formed in the adjacent face of the plate 2" for receiving the projections which would incur unnecessary operations. Therefore it is believed that the construction shown presents the simplest and most desirable form of the present invention. Furthermore while the interlocking parts 9—14 and 10—15 are shown as spaced on the transverse center plane of the spring this however is not absolutely essential as they can be disposed at other positions, such a position for instance as the longitudinal center plane. It will however be appreciated that as the spring flexes the transverse center plane contains the parts of the spring plate that are least affected, that is to say, where the movement is least and in fact is inappreciable. Obviously this is the best location for the interlocking parts in order to maintain a permanent and fixed interlocking of the coupling plate 5 directly with both the main spring plate 2" and the encompassing band 7, as well as the permanent and fixed interlocking of all of the spring plates to their adjacent spring plate or plates and of the outermost plate opposite the main plate to the encompassing band portion 7'.

While the preferred embodiment and suggested modifications have been set forth it will be understood that various other changes and modifications may be made as to form, structure and arrangement of parts without departing from the spirit of the invention, and that all such changes and modifications as fall within the scope of the appended claims are contemplated as a part of this invention.

The invention claimed and desired to be secured by Letters Patent is:

1. A laminated spring comprising a set of superposed interlocking spring plates; a one-piece coupling plate interlocked with one of the outermost of said spring plates at the longitudinal center of said spring; and a one-piece band encompassing all of said plates in tight engagement therewith effecting holding of said plates tightly pressed one against the other at their longitudinal central portions, a face of said band directly contacting with the outer face of said coupling plate, and said band and said coupling plate at their said contacting faces comprising two spaced pairs of permanently interlocked parts, one of said parts of each of said pairs being a depression and the other of said parts of each of said pairs being a projection fitting into said depression, one of said parts of each of said pairs being carried by said band and the other of said parts of each of said pairs being carried by said coupling plate.

2. A laminated spring comprising a set of superposed interlocked spring plates; a one-piece coupling plate interlocked with one of the outermost of said spring plates at the longitudinal center of said spring; and a one-piece band encompassing all of said plates in tight engagement therewith effecting holding of said plates tightly pressed one against the other at their longitudinal central portions, a face of said band directly contacting with the outer face of said

coupling plate, and said band and said coupling plate at their said contacting faces comprising two spaced pairs of permanently interlocked parts disposed in the transverse center plane of said spring, one of said parts of each of said pairs being a depression and the other of said parts of each of said pairs being a projection fitting into said depression, one of said parts of each of said pairs being carried by said band and the other of said parts of each of said pairs being carried by said coupling plate.

3. A laminated spring comprising a set of superposed interlocked spring plates; a one-piece coupling plate interlocked with one of the outermost of said spring plates at the longitudinal center of said spring; and a one-piece band encompassing all of said plates in tight engagement therewith effecting holding of said plates tightly pressed one against the other at their longitudinal central portions, a face of said band directly contacting with the outer face of said coupling plate, and said band and said coupling plate at their said contacting faces comprising two spaced pairs of permanently interlocked parts, one of said parts of each of said pairs being a depression formed in said band and the other of said parts of each of said pairs being a projection formed on said coupling plate and fitting into said depression.

4. A laminated spring comprising a set of superposed spring plates, each of said plates being formed on one of its faces with a depression and on its opposite face with a projection, said plates being arranged so that a projection on each of said plates fits into a depression on an adjacent plate whereby said plates are interlocked and there is provided on the outer face of one of the outermost of said plates a depression and on the outer face of the other outermost of said plates a projection; a coupling plate provided with a projection fitting into said last mentioned depression; and a one-piece band encompassing all of said plates in tight engagement therewith effecting holding of said plates tightly pressed one against the other at their longitudinal

central portions, said band having a portion adjacent said outermost spring plate having said last mentioned projection, said band portion being provided with a depression into which said last mentioned spring plate projection fits, and said band having another portion directly contacting at one of its faces with an adjacent face of said coupling plate, and said band and said coupling plate at their said contacting faces comprising a pair of permanently interlocked parts, one part being a depression formed in said band and the other part being a projection formed on said coupling plate and fitting into said last mentioned depression.

5. A laminated spring comprising a set of superposed spring plates, each of said plates being formed on one of its faces with a depression and on its opposite face with a projection, said plates being arranged so that a projection on each of said plates fits into a depression on an adjacent plate whereby said plates are interlocked and there is provided on the outer face of one of the outermost of said plates a depression; a coupling plate provided with a projection fitting into said last mentioned depression; and a one-piece band encompassing all of said plates in tight engagement therewith effecting holding of said plates tightly pressed one against the other at their longitudinal central portions, said band having an inner face portion directly contacting with an outer face portion of said coupling plate, and said band and said coupling plate at their said contacting face portions having a pair of permanently interlocked parts formed one on each of said contacting portions, one of said interlocked parts being a depression and the other of said interlocked parts being a projection fitting therein, one of said interlocked parts being formed integrally with said band and the other of said parts being formed integrally with said coupling plate.

ALBIN K. STRANDBERG.
THEODORE R. WEBER.
CHARLES M. IPSEN.