No. 705,792. Patented July 29, 1902.

J. T. SCHLACKS.

KEY CONNECTION.

(Application filed May 21, 1901.)

(No Model.)

Fig. 1.

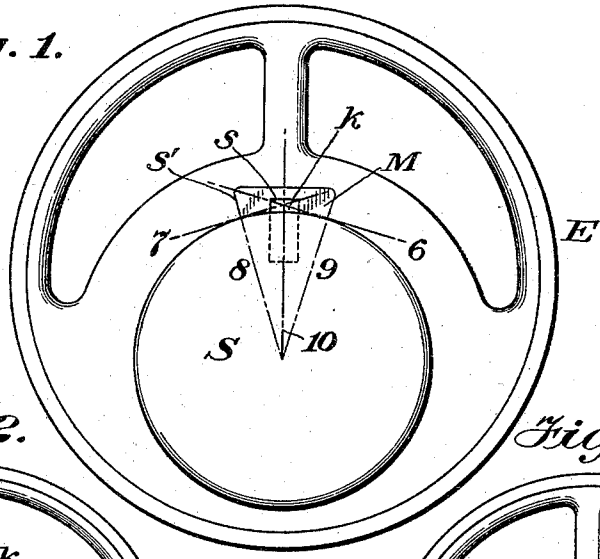


Fig. 2.

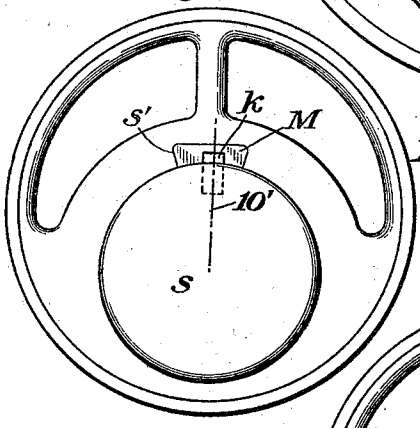


Fig. 3.

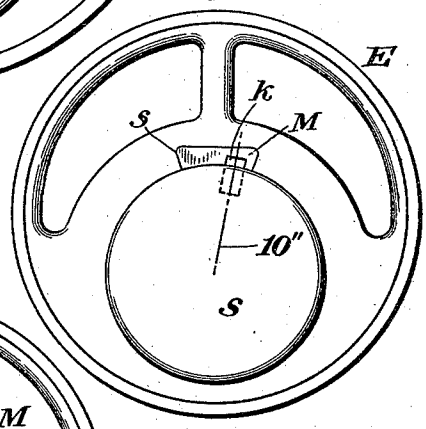


Fig. 4.

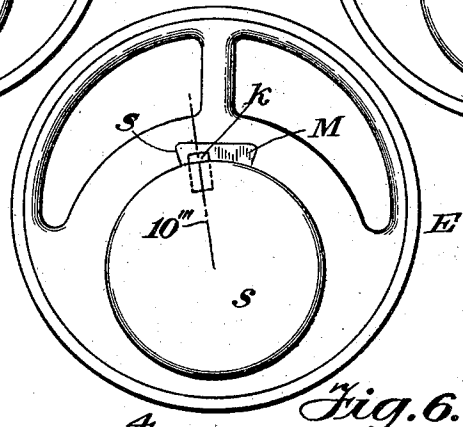


Fig. 8.

Fig. 6.

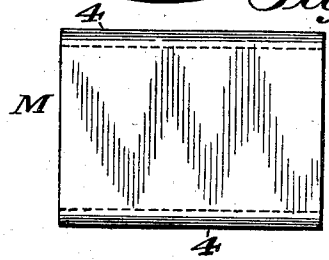


Fig. 5.

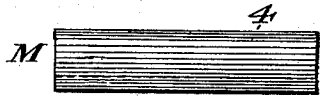
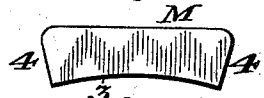


Fig. 7.



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UNITED STATES PATENT OFFICE.

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KEY CONNECTION.

SPECIFICATION forming part of Letters Patent No. 705,792, dated July 29, 1902.

Application filed May 21, 1901. Serial No. 61,263. (No model.)

To all whom it may concern:

Be it known that I, JOSEPH T. SCHLACKS, a citizen of the United States, and a resident of Helper, in the county of Carbon and State of Utah, have invented certain new and useful Improvements in Key Connections, of which the following is a specification.

This invention relates to key connections, and especially to a connection for coupling a driven member—such as a pulley, eccentric, or gear—to a driver; and the main object of the invention is to provide a connection by means of which a driven part may be adjusted relatively to a driver without reshaping either of those elements of the key connection which ordinarily are formed in or on the members to be connected.

In a key-and-slot connection of the ordinary type a key is formed on or secured to one of two members to be connected and a complementary slot is made in the other of said members, as this constitutes a simple and effective means of joining driving and driven members and maintaining them in a predetermined relation to each other in the direction of their movement. With such a connection as this, however, it is impossible to change the relative adjustment of the connected members without reshaping either the key or the slot, or both, and this is always inconvenient and usually difficult, especially when the driving and driven members are large and heavy parts, as is often the case, and a very accurate adjustment is required.

My present invention is especially designed and intended to avoid the reshaping of either the driving or the driven member coupled by a key-and-slot connection, and I accomplish this result by providing as an element of the connection a removable connector or intermediate which when in position will maintain a predetermined relation to one of the members to be connected and will be joined to the other of said members, preferably by means of a key-and-slot connection. This intermediate, it will be evident, may be a relatively small part as compared with the main members connected, and hence it may be readily manipulated and shaped to obtain the desired connection. This intermediate is intended to have a master portion which will coöperate with a complementary part of one of the members connected and an individual portion adapted to control the relative adjustment of such members. In order to accomplish this result, some means should be provided for varying the relation between the master portion of the intermediate and the individual portion thereof, and I prefer to accomplish this by supplying the intermediate in the form of a blank having a finished master portion or master connector and a blank surface, which latter may be shaped in such a manner as to form at any one of a plurality or series of points or positions in such blank surface an individual portion or connector, and this when so shaped will obviously occupy a characteristic position corresponding to a definite relative adjustment of the members to be connected. This individual portion of the intermediate will ordinarily be a key-slot complementary to the usual key carried by the other member and when properly shaped will form with such key an effective key-and-slot connection regardless of the position of such individual slot relative to the master portion of the intermediate. Should this individual connector or slot be improperly shaped, and hence locate inaccurately the members to be coupled, or should it be desired to change the relative adjustment of said members after the connection thereof, this may be accomplished by providing in the key-and-slot connection an intermediate having the individual portion or slot thereof in a different characteristic position relative to the master portion of such intermediate. In some cases this change in the relative adjustment of the parts—that is, in the relation between the intermediate and an adjoining member connected thereto—may be effected by forming a new slot in the intermediate; but I regard this as undesirable, and I prefer to secure a changeable relation of these parts by substituting for the intermediate in use another having a like master portion with an individual portion shaped with its key-slot located in a different characteristic position, as the intermediate itself is small and can be furnished at a low cost, and a stronger connection will result from the shaping of a new blank than from the reshaping of the improperly-positioned individual portion of the old intermediate or key. As each intermediate is ordinarily formed with a blank surface of considerable length, it will be seen that when a relatively narrow key-slot is the individ-

ual connector to be formed therefrom said slot may be located in any one of a very large number of positions spaced at minute intervals, and hence a wide range of accurate adjustment is possible with my improved key connection by simply cutting the key-slot at the proper point in the individual surface of the blank.

The intermediate or connector employed herein has master and individual portions the relation between which may be varied at will, and hence said intermediate constitutes a connecting master-key, the master portion of which in this case is the key element of one key-and-slot connection between the members to be coupled and the individual portion of which is an element (usually the key-slot) of another key-and-slot connection with the other of the two members to be coupled. Hence the two members to be coupled are joined by a duplex key-and-slot connection made up of two single pairs of key-and-slot connections, the intermediate embodying one member of each of such single pairs.

In the drawings accompanying this specification and forming part of the application, Figure 1 is an end view of a driver and an eccentric coupled by means of my key connection and illustrates the key-slot in its normal central characteristic position in the master-key. Figs. 2, 3, and 4 are similar views, on a smaller scale, showing three other relative adjustments of the driver and eccentric as controlled by three other characteristic positions of the individual key-slot of the master-key. Figs. 5, 6, and 7 are respectively a side elevation, a plan, and an end elevation of an intermediate blank or master-key blank, illustrated on an enlarged scale. Fig. 8 illustrates a modification of the invention.

Similar characters designate like parts in the different figures of the drawings.

My invention is applicable wherever it is desired to connect two members, especially two rotary members, in such a manner as to provide for subsequent relative adjustment thereof; but it is principally useful for connecting large and heavy members that cannot be handled readily and shaped accurately or which for some reason it is inconvenient to remove for any considerable length of time. It is especially useful for obtaining quickly a new and accurate adjustment of an eccentric on a shaft, particularly an eccentric controlling a valve motion of a locomotive-engine for changing the point of cut-off, &c. For this reason I have illustrated my invention in the present case as applied to a driver or shaft S and a driven member or eccentric E, mounted on such shaft. The connection between these two parts is substantially that hereinbefore described—that is to say, it is a key-and-slot connection having an intermediate or master-key, one portion of which constitutes a master connector and the other an individual connector, the individual connector or individual key-slot being located in such a position relative to the master portion of the intermediate as to locate the shaft and the eccentric in corresponding adjusted positions relative to each other.

In carrying my invention into effect one member to be connected—in this case the driver or shaft S—will usually have one element of an ordinary key-and-slot connection—in this case the key element *k*. This key may be either formed on or set into the driver S and will coact with a complementary element having a predetermined relation to the other member to be connected to the driver S. This complementary member or key-slot, which is indicated at *s*, is not, however, formed in this case directly in the member E, but instead is formed in an intermediate coacting with the key *k* and maintained in the desired relation to the member E. Ordinarily this intermediate will be a master-key, the master portion of which will be in the form of a key and will be seated in a corresponding key-slot in the member E, and this key-slot, which is indicated at *s'*, is the only feature that distinguishes the construction of the member E from corresponding members ordinarily used, or, in other words, this slot is a somewhat-larger key-slot than has heretofore been cut in the journal-surface of a driven part, and it is preferably of a different shape from the slots ordinarily used. This is because the intermediate or master-key M is preferably of a different shape from the ordinary key, it being in this case a wide but shallow member having a concave bottom wall 3 defined by an arc struck from the same center as the journal-surface of the members S and E in order that such concave surface 3 may conform to such journal-surfaces and a pair of end walls 4 4, converging toward each other, and in this case toward the bottom wall 3, to form a blank or intermediate substantially wedge-shaped in cross-section. Not only do the walls 4 4 converge toward the bottom wall 3, but they are also preferably radii of the circle from the center of which the arc 3 is struck, the object of this being to transmit the power most perfectly from the driver to the driven member. This will be clear by referring to Fig. 1, in which 6 and 7 are two tangents to the periphery of the shaft S at the points of intersection of the radii 8 and 9 with such periphery, and when both walls 4 4 are so formed it will be evident that not only the forward wall, but also the rear wall, of the master-key, and hence the corresponding forward and rear walls of the key-slot *s'*, will always be perpendicular to the path of movement of the driver and of the driven member, or, in other words, perpendicular to the tangent at the point of intersection with the periphery of the shaft.

The intermediate M is a master-key because it constitutes a uniform key element of the key-and-slot connection. In order to constitute a connecting device suitable for carrying this invention into effect, it must also

have an individual connecting portion or individual connector; but it is not necessary to supply the master-key in a finished condition with an individual connector or individual key-slot finally located relatively to the master portion of such master-key, it being desirable usually to furnish the master-key in the form of a blank, substantially such as shown in Figs. 5, 6, and 7, with one face thereof blank (in this case the wall 3) in order that the individual connector or individual key-slot *s* may be cut afterward in any desired position in such surface to obtain any required relative adjustment of the two members to be coupled. The length of the wall 3 will permit said slot to be located in any one of a large number of individual or characteristic positions, which positions will determine the adjustment of the members to be coupled by locating or locking the complementary individual element or key *k* of the key-and-slot connection with the member S in the desired position at any determined point in the length of the face 3.

In Figs. 1, 2, 3, and 4 I have illustrated four different characteristic positions of the key-slot in the wall 3, said key-slot when so placed controlling four different relative positions of the members S and E, Fig. 1 showing the normal central position at which the key-slot *s* will usually be cut, Fig. 2 illustrating a master-key having its individual key-slot slightly to the right of the central position, the amount of the angular adjustment as compared with the zero-line 10 in Fig. 1 being indicated by the line 10′, Fig. 3 showing an extreme adjustment of said slot to the right, as indicated by the line 10″, and Fig. 4 an opposite extreme adjustment of the key-slot to the left, as indicated by the line 10‴. Many other characteristic positions of the individual key-slot *s*′ with respect to the master portion of the key M may of course be obtained and a wide range of adjustment in either direction secured, this range being limited only by the length of the face 3, which will preferably be about that indicated, this being sufficient for all ordinary purposes.

In readjusting the positions of the two connected members either or both of the keys M and *k* may be removed, after which the driven member may be turned to the desired new position and the master-key blank either placed opposite or inserted in the key-slot *s*′ and the new position for the individual key-slot in the master-key marked off, after which the latter slot may be cut in the blank and the finished master-key, having its individual slot in the new adjustment-controlling characteristic position, inserted in the slot *s*′ and driven into place either with or without the individual key *k*, according as the latter is or is not removed before the new adjustment is made.

It is of course evident that the adjustability of the device to different conditions or positions may be as well due to the cutting of a new key-slot in the same blank as to the cutting of a key-slot in a new blank, and in Fig. 8 I have shown a modification of the invention in which the master-key M′ has therein three individual slots the positions of which correspond substantially to those shown in Figs. 1, 3, and 4.

I claim—

1. The combination with a pair of contiguous members to be connected, of a removable intermediate inserted between said members and positioned to maintain a predetermined fixed relation to both of them in any single setting of the parts, and connecting means between said intermediate and one of said members and having a changeable relation to said intermediate.

2. The combination with a pair of contiguous members to be connected, of a removable intermediate inserted between and positioned to maintain a predetermined fixed relation to both of said members, and a key-and-slot connection between said intermediate and one of said members.

3. The combination with a pair of members to be connected, of an intermediate inserted between said members, a key-and-slot connection between said intermediate and one of said members and having a changeable relation to said intermediate, and a fixed connection between said intermediate and the other of said members.

4. The combination with rotary driving and driven members, of a removable intermediate inserted between said members and positioned to maintain a predetermined fixed relation thereto, and a key-and-slot connection between said intermediate and one of said members.

5. The combination with a rotary driver and with an eccentric, of a removable intermediate inserted between said members and positioned to maintain a predetermined fixed relation thereto, and a key-and-slot connection between said intermediate and one of said members.

6. The combination with a pair of contiguous members to be connected, of a removable intermediate inserted between said members and positioned to maintain a predetermined fixed relation thereto and having its inner wall in the meeting line of said members, and changeable connecting means between said intermediate and the other of said members.

7. The combination with rotary driving and driven members, of a removable intermediate inserted between said members and positioned to maintain a predetermined fixed relation thereto and having an inner wall conforming to the journal-surfaces of said members, and changeable connecting means between said intermediate and the other of said members.

8. The combination with a pair of members to be connected, of a key-and-slot connection therefor embodying a removable intermediate inserted between said members and having a master portion positioned to maintain

a predetermined fixed relation to both of said members in any single setting of the parts and also having a changeable relation thereto governed by a plurality of adjustment-controlling individual portions located in different characteristic positions with respect to the master portion and each constituted to form when in use one element of the key-and-slot connection.

9. The combination with a pair of members to be connected, of a key-and-slot connection therefor embodying a master-key inserted between and positioned to maintain a predetermined fixed relation to both of said members and having an adjustment-controlling individual key-slot located in any characteristic position.

10. The combination with rotary driving and driven members, of a key-and-slot connection therefor embodying a master-key inserted between and positioned to maintain a predetermined fixed relation to both of said members in any single setting of the parts and also having a changeable relation thereto governed by a plurality of adjustment-controlling individual portions located in different characteristic positions and each constituted to form when in use one element of the key-and-slot connection.

11. The combination with rotary driving and driven members, of a key-and-slot connection therefor comprising an individual key in fixed relation with one of said members and a master-key in fixed relation with the other of said members and having an adjustment-controlling individual key-slot located in any characteristic position for receiving said individual key.

12. The combination with rotary driving and driven members, of a key-and-slot connection therefor comprising an individual key in fixed relation with one of said members and a master-key in fixed relation with the other of said members and having a journal-surface and also having in said journal-surface an adjustment-controlling individual key-slot located in any characteristic position for receiving said individual key.

13. The combination with rotary driving and driven members, of a key-and-slot connection fixed relatively to both of said members to prevent turning thereof relatively to each other said key and slot having contacting forward walls defined by the radius of the driver.

14. The combination with rotary driving and driven members, of a key-and-slot connection fixed relatively to both of said members to prevent turning thereof relatively to each other said key and slot having contacting forward walls and contacting rear walls disposed in planes passing through the axis of the driver.

15. The combination with a pair of movable members to be connected, of an intermediate having a slot connection with one of said members the forward wall of which connection is perpendicular to such path of movement, and a key-and-slot connection between said intermediate and the other of said movable members.

16. The combination with a pair of movable members to be connected, of an intermediate having a slot connection with one of said members the forward and rear walls of which connection are perpendicular to such path of movement, and a key-and-slot connection between said intermediate and the other of said movable members.

17. The combination with rotary driving and driven members, of an intermediate having a slot connection with one of said members the forward wall of which connection is defined by the radius of the driver, and a key-and-slot connection between said intermediate and the other of said rotary members.

18. The combination with rotary driving and driven members, of an intermediate having a slot connection with one of said members the forward and rear walls of which connection are defined by radii of the driver, and a key-and-slot connection between said intermediate and the other of said rotary members.

19. In a key-and-slot connection, a connecting master-key made in one piece and of such construction that its end walls are in engagement with the end walls of its coacting slot, said master-key also having an adjustment-controlling individual connector.

20. In a key-and-slot connection, a connecting master-key of such construction that its end walls are in engagement with the end walls of its coacting slot and said master-key also having an adjustment-controlling individual key-slot.

21. In a key-and-slot connection, a tapered connecting master-key of such construction that its end walls are in engagement with the end walls of its coacting slot and said master-key also having an adjustment-controlling individual key-slot.

22. In a key-and-slot connection, a connecting master-key wedge-shaped in cross-section and of such construction that its end walls are in engagement with the end walls of its coacting slot and said master-key also having an adjustment-controlling individual key-slot.

23. In a key-and-slot connection, a connecting master-key wedge-shaped in cross-section and of such construction that its end walls are in engagement with the end walls of its coacting slot and said master-key also having a concave journal-surface, tapered sides converging toward said journal-surface, and an adjustment-controlling individual key-slot in said concave surface.

Signed at Helper, in the county of Carbon and State of Utah, this 15th day of May, A. D. 1901.

JOSEPH T. SCHLACKS.

Witnesses:
L. E. SMITH,
GEO. NEWMAN.