F. T. SWANSON.

STEAM FRICTION DEVICE.

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1,394,952. Patented Oct. 25, 1921.

Fig. 1.

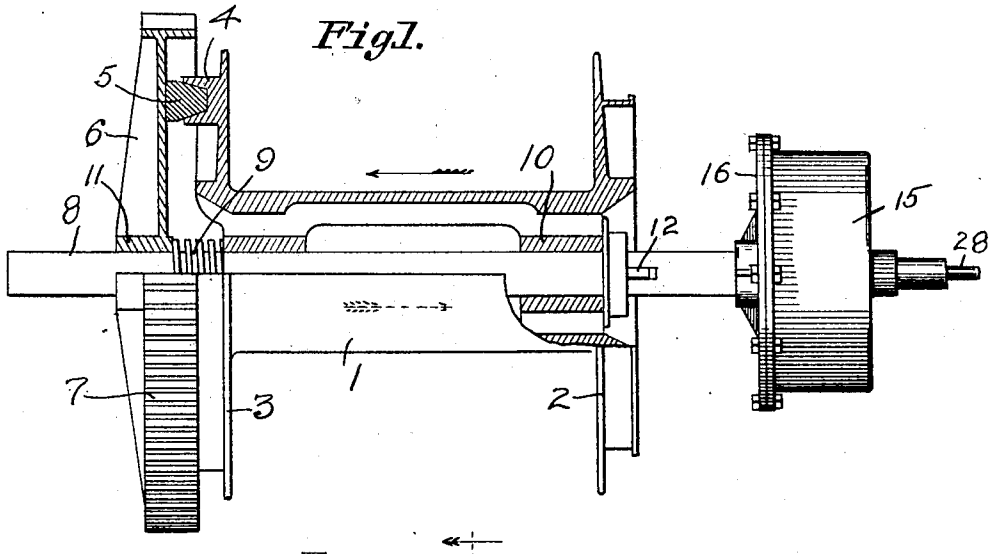


Fig. 2.

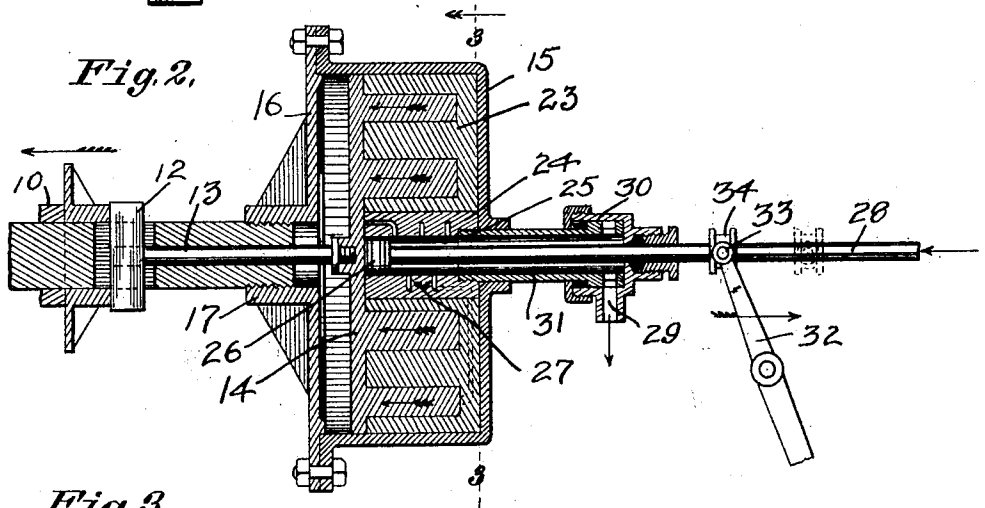


Fig. 3.

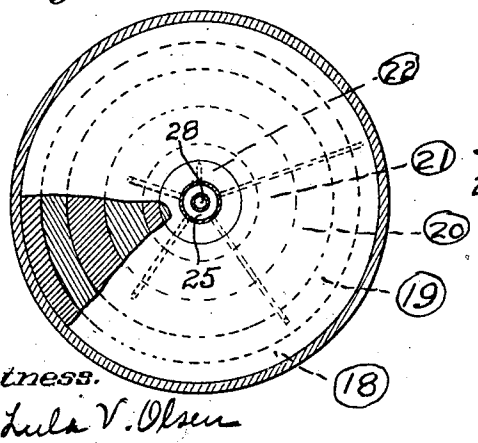
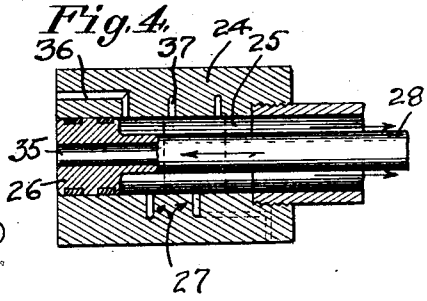


Fig. 4.



Witness.

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STEAM FRICTION DEVICE.

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To all whom it may concern:

Be it known that I, FRANK T. SWANSON, a citizen of the United States, residing at Hayward, in the county of Alameda and State of California, have invented new and useful Improvements in Steam Friction Devices, of which the following is a specification.

This invention relates to a steam friction device and has reference more particularly to a device for actuating the clutch on a cable drum or the like.

The primary object of the invention is to provide an improved form of device whereby the gripping effect between the cable drum and driving medium therefor may be varied at will.

Other objects will appear as the description proceeds and the accompanying drawing illustrates the preferred manner of reducing the invention to practice. In said drawing Figure 1 is a view in elevation showing the cable drum, and its clutch partly in section; Fig. 2 is a longitudinal section of the steam friction device, and its associated parts; Fig. 3 is a section on line 3—3 Fig. 2 and Fig. 4 is a longitudinal section of the steam valve and its housing.

Referring to the drawing in detail: 1 represents the cable drum having the usual confining flanges 2 and 3, the flange 3 being provided with an annular grooved block 4 made to receive the beveled ring 5 which is carried by the wheel 6, which in turn is provided with a geared surface 7 around its circumference. Both wheel 6 and drum 1 are coaxially, but independently, mounted on a shaft 8; that is to say, the wheel is keyed to the shaft whereas the drum is capable of sliding longitudinally thereon. A coil spring 9 arranged between the bearing 10 of the drum and the bearing 11 of the wheel is adapted to normally exert an influence between these parts to slide the drum on the shaft away from the wheel. As stated the drum is mounted free to slide longitudinally on the shaft 8, and in order to impart this sliding movement and produce a gripping effect between the wheel and drum, a thrust is made on the bearing 10 of the drum by means of the radial pin or gib 12 carried on the end of the rod 13 to be presently described. With this construction, it will thus be seen by imposing a thrust on the bearing 10, the drum will be moved longitudinally on the shaft 8 toward the wheel 6 to realize a gripping effect between the ring 5 and the groove in the annular ring 4 carried by the flange 3 of the drum. It will also be seen that by varying the force of the thrust the wedging effect between parts 4 and 5, may be varied.

The construction so far described is more or less conventional in an equipment of this kind, particularly where employed on yarding engines and the like. However, the salient features of the present invention reside primarily in means for imparting a thrust to the bearing 10 of the drum for connecting the drum with the wheel and for varying the degree of clutching effect between these parts, to which end, it is proposed to extend the rod 13 through an axial bore in the shaft 8 and terminate the same with a connection on the inner side of the piston 14 which is confined within a steam chamber 15 which in turn is provided with a closed end 16 having a threaded collar 17 made to receive the threaded end of the shaft 8. The piston 14 in reality comprises several piston structures which are preferably in the form of annular rings 18, 19, 20, 21, and 22, all of which being coaxially arranged with the spaces therebetween made to receive like rings arranged on the face of a block 23 which in turn is fixed to the inside of the chamber 15 and against the end thereof. Arranged axially of the piston 14 is a manifold sleeve 24 having an axial bore 25 to accommodate a piston valve 26, with communicating ports 27 arranged in the sleeve 24 and controlled by the piston valve 26 for establishing communications between the steam ports and the pistons. For instance, each one of the ports 27 will extend radially to its respective pistons so that the piston valve 26 may be reciprocated back and forth in the sleeve 24 for controlling the effective port area of the ports for selectively establishing communications to the pistons. Steam may be introduced through the tube 28 which carries the piston valve 26 and exhaust it through the discharge 29 which is arranged in the stuffing box 30 and communicates with the spacing 31 surrounding the tube 28.

Any convenient means may be arranged for manipulating the piston valve 26; for instance, a fulcrumed lever 32 may be arranged with a connection as at 33 to a collar 34 carried by the tube 28 so that the lever 32 may be swung back and forth for sliding

the piston valve 26 and establishing a communication with the steam supply and any one of the ports through the axial bore 35 in the end of the said valve.

With this construction, it will be readily seen that by moving the piston valve 26 so that the axial bore 35 registers with the port 36, steam may be admitted to act upon the piston 22. As the area of the piston 22 is limited, the thrust imparted to the drum will be slight. Consequently, the influence of the spring 9 will not be sufficiently overcome to effect a material change in the wedging relation between the members 4 and 5 of the clutch. Should a stronger thrust be necessary to realize a more effective wedging engagement of the members 4 and 5, the valve may be moved to establish a communication with the port 37 and thus enable the piston 21 to be brought into use. By moving the piston valve 26 to establish a communication between all of the ports, the full operating capacity of the device may be accomplished.

A suitable control valve may be used for admitting steam to the tube 28. It should also be noted in relieving any one of the pistons, the piston valve 26 must be moved to a position in front of the port leading to the piston tube exhaust so as to leave an uninterrupted discharge through the space 31 to the exhaust outlet 29.

It will be appreciated the tube 28 will communicate with the steam supply by a revolving steam joint permitting the tube to turn relative thereto.

A brief summary of the construction and operation of the apparatus may be related as follows: The wheel 6 is keyed to the shaft S and these two elements will rotate together. The end of the shaft is threaded to the collar 17 of the steam chamber; thus the steam chamber together with parts inclosed therein will rotate with the shaft. The short pipe which provides the spacing 31 being threaded into the manifold sleeve 24 will also rotate with the above parts, but the stuffing box will remain fixed as the pipe is confined in the stuffing box by a revolving steam joint. The piston 26 will fit the bore of the manifold sleeve tight enough so that it too will tend to rotate in which event it will rotate the tube 28 also.

The piston 14 is slidably mounted so that its annular rings may reciprocate in the annular grooves in the block 23 the same as a cylinder and piston structure.

The valve 26 controls the introduction of steam into the so-called cylinder and piston structure and it is to be noted that the ports are opened progressively; that is, to introduce steam into the largest one of the cylinders the piston opens the ports to the smaller cylinders in its movement to uncover the larger port. This gives a gradually increasing thrust to the drum instead of a sudden forcible thrust. The same principle applies in going from the large cylinder to the smallest in that the thrust on the drum is relieved gradually. In this way the clutching effect is graduated.

I claim:

1. In a device, of the class described and in combination with a cable drum, a driving wheel, a friction clutch between the driving wheel and the cable drum, a rotating shaft upon which the driving wheel is keyed, the cable drum being mounted free to slide longitudinally on said shaft and means for imparting a thrust to the cable drum to connect the same in driving relation with the driving wheel through said clutch, comprising a steam responsive device, including a steam chamber mounted upon the rotating shaft and having a piston and a cylinder structure therein, said structure comprising a block having a plurality of co-axial annular steam expansion spaces, the piston comprising a plurality of co-axial annular ring members corresponding to said steam expansion spaces and adapted to reciprocate therein, said piston being connected to said cable drum, and means for progressively introducing steam to said steam expansion spaces to actuate said piston.

2. In a device of the class described and in combination with a cable drum, a driving wheel, a friction clutch between the driving wheel and the cable drum, a rotating shaft upon which the driving wheel is keyed, the cable drum being mounted free to slide longitudinally on said shaft and means for imparting a thrust to the cable drum to connect the same in driving relation with the driving wheel through said clutch, comprising a steam responsive device, including a steam chamber mounted upon the rotating shaft and having a piston and a cylinder structure therein, said structure comprising a plurality of steam expansion spaces of different areas, and the piston comprising a plurality of co-axial annular ring members corresponding to the said steam expansion spaces and adapted to reciprocate therein, a manifold sleeve in the axis of said cylinder structure having a plurality of steam ports establishing separate communications with each of the said steam expansion spaces, said piston being connected to the cable drum, and a valve in said manifold sleeve for progressively opening or closing said ports whereby a graduated thrust may be imparted to the cable drum substantially as described.

FRANK T. SWANSON.