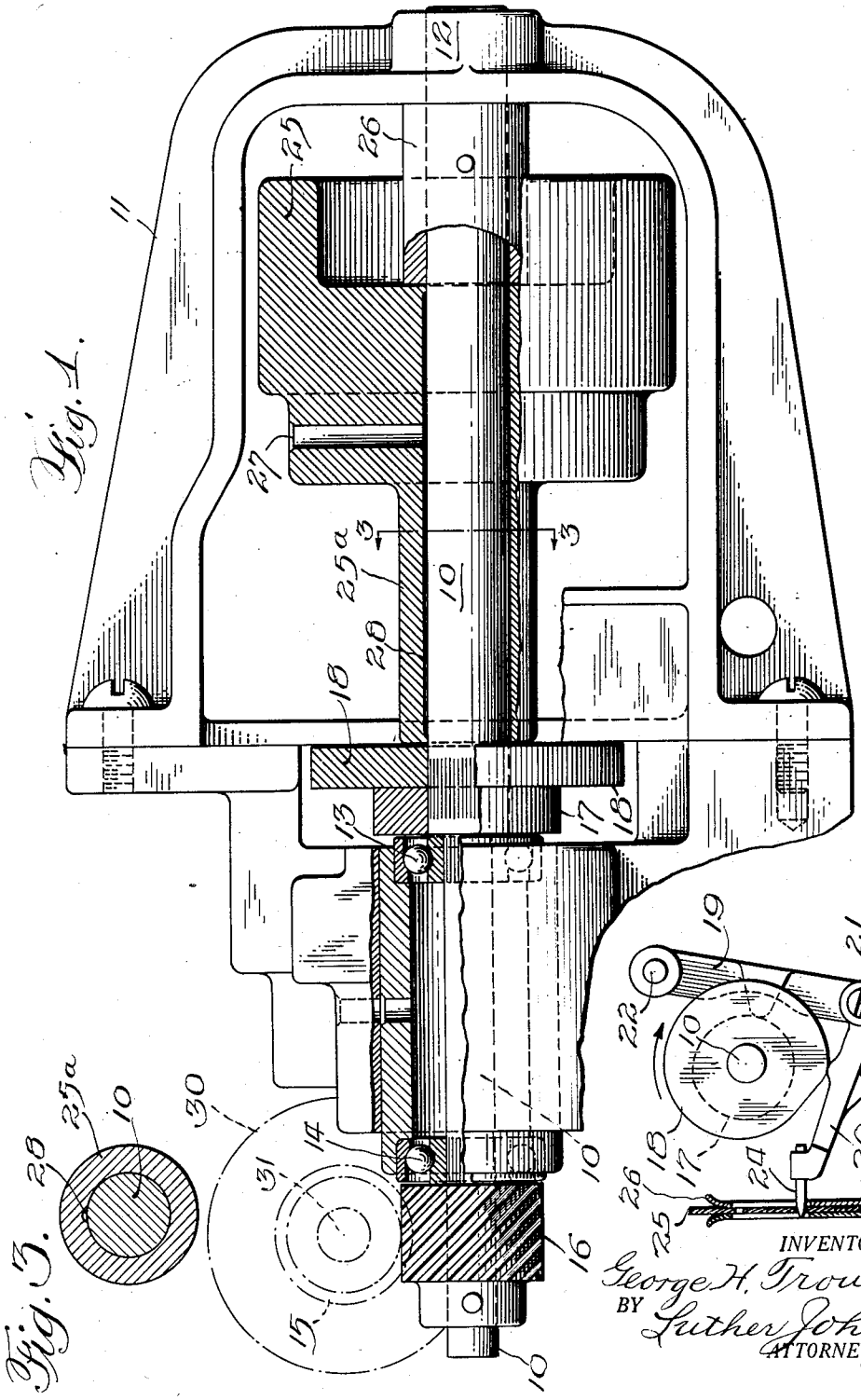
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REGULATING ROTARY MOTION DEVICE

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REGULATING ROTARY MOTION DEVICE

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1 Claim. (Cl. 271—2.3)

These improvements relate to means for rendering more smooth or regular the action of a device or mechanism operated by rotary motion.

It has a peculiarly appropriate application to the film-shifting mechanism of a motion picture machine. The film in such case is moved step by step, and the rapidly repeated reversals of motion (as in a claw type of film shifter) and the intermittent decreases and increases in the speed of parts (as in the Geneva movement type of mechanism) develop various objectionable operating characteristics. These have been sought to be overcome or minimized by the action of a fly wheel rigidly secured to a rotary driving part. The use of a fixed fly wheel is advantageous to the more smooth and even operation of the machine as a whole, or of particular parts thereof, but it does not provide the desired results in connection with the film-shifting mechanism, and I am disclosing herein a new and additional means for smoothing out and rendering more quiet the operation of the film-shifting mechanism and directly associated parts.

A smooth, even and regular action of the film-shifting mechanism is of importance with respect to the quality of the picture projection, and the reduction of wear, vibration and noise. Vibration and noise are especially objectionable in a machine where there is sound synchronized with the picture.

In the drawing Figure 1 is a view partly in side elevation and partly in medial longitudinal section showing the application of the present invention to a film-shifting mechanism;

Fig. 2 is a side elevation of parts, on a reduced scale, which immediately cause the film to travel step by step; and

Fig. 3 is a cross section on the line 3—3 of Fig. 1.

The present improvements rest upon my discovery of the peculiar effect of a loose fly wheel upon the shaft driving the claw movement.

In the drawing what I shall call the driving shaft 10 has bearings in frame 11 at 12, 13 and 14. It is rotated by a gear 15 shown by dotted lines meshing with a pinion 16 on shaft 10. There are two cams 17 and 18 on the shaft, and these operate respectively on the lever arms 19 and 20 (Fig. 2) pivoted together at 21, the two levers being swung from a pivot 22, with a spring 23 directed so as simultaneously to maintain the arms 19 and 20 in contact with their associated cams respectively. Lever arm 20 carries a claw 24 adapted to engage the film 25 passing between guide members 26. The action of the cams and levers is such as to move the claw and film downward, then the claw is retracted upward slightly and then moved away from the film and upward and inward to re-engage the film, thus moving the film step by step.

A fly wheel or balanced weight member 25 is so loosely positioned on driving shaft 10 that the shaft may turn freely relative to this wheel or weight. The sleeve 26 fixed to shaft 10 is merely a spacer adapted to maintain the fly wheel in its desired position. The fly wheel is in driven relation to the shaft through frictional engagement therewith. It is preferable that there be a considerable frictional tendency to rotate the fly wheel, and I therefore give the fly wheel a relatively long bearing surface, to this end forming a sleeve-like extension 25*a* coaxial with the main body, and this coaxial extension 25*a* is shown as abutting the side of cam 18.

There is an oil duct 27 for lubricating the bearing surface between the shaft and the fly wheel, and there is an oil channel 28 cut into the fly wheel longitudinally, almost from end to end thereof, adapted to distribute the lubricant from end to end of the wheel. The wheel should be well lubricated to prevent undue wear and it makes for a smoother operation. While there is a film of oil between the fly wheel and the shaft these two members are in the relation universally called frictional contact, frictional engagement, etc.

When the machine is quiescent and shaft 10 is then started the fly wheel or weight carried loosely by the shaft gradually picks up speed as its inertia is overcome by the frictional application of driving power to it, and in time reaches its maximum speed. While it might seem that the fly wheel speed would always be at least slightly less than that of shaft 10 I find by means of the stroboscope, applied to appropriate markings on fly wheel 30 (fixed on shaft 31) and on fly wheel 25 (loosely on shaft 10), that these two fly wheels turn at the same speed soon after the starting; and since shaft 10 is driven positively from shaft 31 it appears that shaft 10 and fly wheel 25 rotate at the same speed after the initial inertia of wheel 25 is overcome. This indicates that at full speed the constant frictional drag upon the wheel is sufficient to overcome the constant tendency of the wheel to lag relative to the shaft. The frictional drag is of considerable amount since it starts rotating the wheel from zero speed and augments it to full speed.

Shaft 10 is driven at a substantially constant speed when the film is being normally shifted.

The load comes upon the shaft intermittently and there is a condition of substantially no load between the load conditions. The mechanism is naturally of a jumpy and jerky kind, with a tendency to backlash in the gears and shocks at the pivotal connections. This is reduced as much as possible by precision gear meshing and in fitting the other connections. With fly wheel 25 removed or with it fixed to the shaft there is a continuous and regular clicking of parts showing that great care in the machining does not overcome the objections. The loose fly wheel does overcome them, however, to a very pronounced extent, and to such extent as to provide a remarkably smooth and quiet action. The difference between the two actions, the old and the new, is so distinct that the ordinary observer would pronounce the old action very bad; and yet the old action is of the ordinary kind. I may mention in this connection that the objections referred to do not exist to so great an extent in the large and heavy motion picture machines, where there are great masses of metal adapted to absorb the shocks of an intermittently applied load. The present invention would be important in those connections also, but is of more pronounced benefit in the lighter machines.

I contemplate as being included in these improvements all such changes, variations and departures from what is thus specifically illustrated and described as fall within the scope of the appended claim.

I claim:

The combination of two rotary shafts, means for driving one thereof by the other, an intermittently-operating mechanism driven by one of said shafts and having a substantially rapid intermittent operation, a flywheel on each of said shafts, one of said flywheels being loosely mounted on its shaft for frictional rotation therewith.

GEORGE H. TROUT.