THE WORSLEY MESNES OVERWINDER

This device was an advanced development of the original "Melling's" Overwinder and slow banker which had been produced many years earlier. It was patented in 1933 (No. 412078) and was widely adopted for the control of speed throughout the wind and for banking.

Description.

The device consisted of a centrifugal governor mounted vertically on a common frame with two screwed rods, all rotated by appropriate gearing and driven directly from the engine crankshaft by the usual belt or chain.

On the screwed rods were travelling nuts which represented the position of the cages in the shaft, the gearing being so arranged that the motion of the nuts exactly reflected the motion of the cages.

Fixed to the top of the frame was a piston and cylinder which could be supplied with air or oil, as appropriate and which acted as a dashpot, the piston road being linked to levers which sensed the motion of the travelling nuts on the banking portion of the wind. Also attached to the cylinder were valves, activated by the pressure of the working fluid in the cylinder or mechanical links, these admitted the pressurized working fluid to up to three cylinders attached to the frame which activated the brake gear, closed or unlatched the throttle valve, centralized the reversing lever etc.

Operation. (See diagram for letter references)

Overspeed prevention on the main part of the wind was achieved by the centrifugal governor. As speed rose, the governor weights moved further outwards, raising the collar C1, this in turn moved link C2 and rotated the shaft C3. AT the end of the shaft was an adjustable lever C4. If the speed rose above the predetermined maximum value allowed, then the movement of C4 lifted the valve rod P2 and opened the valve P allowing the working fluid to reach the working cylinders. If the speed was reduced, then the supply of fluid was cut off and the working cylinders were vented through valve P and control was restored to the engineman.

Maximum speed was adjusted by a separate cylinder and weights below the governor, which bore on the rising arm. For man-riding the load on the governor was reduced, thus enabling the valve rod P2 to be moved earlier – at a lower speed. For coal-winding, the load on the governor was increased, thus requiring a higher speed before any action occurred. Switching between the two settings was achieved via a remote valve Z situated on the engineman's platform.

At low speed, such as when approaching bank, the governor's action was minimal, and speed was controlled instead by the pneumatic cylinder.

As the cages entered the last part of the wind, one or other of the travelling nuts engaged with the links I, I1, which were connected to the piston rod at M. As the wind continued, the motion of the nut forced the piston and rod upwards at a rate proportional to the speed. This compressed the working fluid in the cylinder and forced it out through the adjustable needle valves U. As the piston continued to rise it gradually covered the valve openings and so reduced the area through which the fluid could escape. The settings of the needle valves determined the "profile" of the speed reduction required as the cages approached bank. If the speed was too high, then the piston tried to move faster than the fluid could escape and so pressure would rise inside the cylinder. This activated valve R which was linked mechanically to valve P, applying the brakes etc. The final banking speed was set by a separate needle valve T, which could be connected in series with the engineman's valve Z to give different banking speeds for men and coal.

Overwinding.

This was an extension of the above. The piston rod was fitted with a collar which could come into contact with the link lever V and if an overwind was attempted, then it raised the lever V and again actuated valve P.

Worsley Mesnes claimed that the device could control the speed over the whole of the wind and especially during the banking period to within 1ft. per second, which was well within the 5ft. per second required by the Mines Act at the time.

Modifications.

The principal alteration to the above design, apart from the addition of the switches mentioned above, was the addition of so-called "Steam-restriction" or "Slow-banking" gear. This was intended to prevent the sudden opening of the throttle when approaching bank in such a way that the motion would take place before the device had time to react. It "sensed" the pressure in the steam main on the engine side of the throttle valve. A pair of cams was driven by the overwinder which reflected the varying anticipated steam pressure for either man or coal winding. A lever rested on each of the cams. These were pivoted so that as the cams raised one end of the levers, the other end depressed one side of a pressure differential switch, the other side of which was connected to the steam main as above. If the throttle pressure rose above the set pressure on the other side of the switch, then the switch was activated and operated the lever V.

Comment.

The rapid and widespread adoption of this overwinder was a testament to its success. The fact that it did not “trip-out” and require re-setting endeared it to the enginemen. It kept them in control of the engine at all times, and being pneumatic, the forces it applied were progressive rather than sudden and were readily reversed. It was readily adapted to signal the onset of the various conditions of overwind, overspeed etc. by the attachment of suitable switches on the frame. It was only the demand for devices which literally took command away from the engineman and even more strict conditions as to acceleration at any stage of the wind which led to its replacement by further developments of the “Black” and “Walker-Black” type controllers. Many colliery engines, however, ended their working lives in the 1960s still under the control of the Worsley Mesnes device some thirty years after its introduction.