H. McMaster & Dale,

Steam Governor.

No. 101,487. Patented Apr. 5. 1870.

Fig. 1.

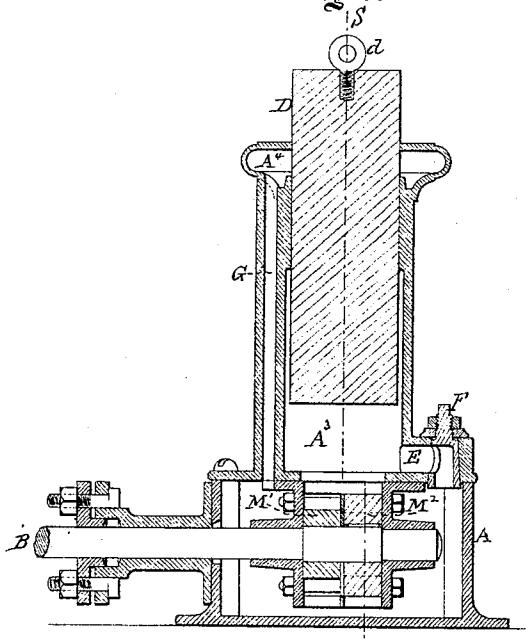


Fig. 2.

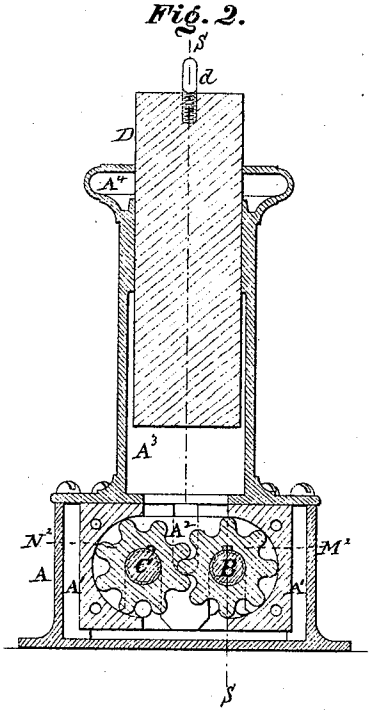
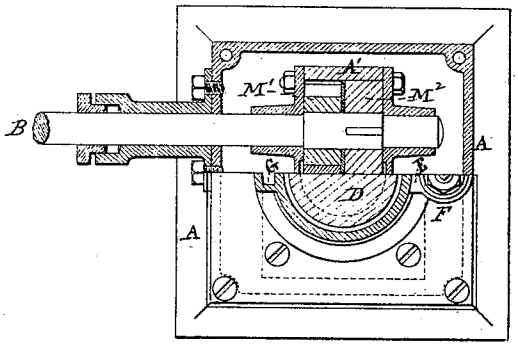


Fig. 3.



Witnesses.

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HUGH DUNBAR McMASTER AND ABRAHAM DALE, OF GUILFORD, IRELAND.

Letters Patent No. 101,487, *dated April* 5, 1870.

GOVERNOR FOR STEAM-ENGINE.

The Schedule referred to in these Letters Patent and making part of the same.

To all whom it may concern:

Be it known that we, HUGH DUNBAR McMASTER and ABRAHAM DALE, of Guilford, in the county of Down, Ireland, in the United Kingdom of Great Britain and Ireland, have invented certain new and useful Improvements in Governors for Steam-Engines, Water-Wheels, and analogous machines; and we do hereby declare that the following is a full and exact description thereof.

The accompanying drawings form a part of this specification.

Figure 1 is a vertical section through the apparatus on the line S S in fig. 2;

Figure 2 is a corresponding section on the line S S in fig. 1; and

Figure 3 is a horizontal section in two planes, one part on a low plane and the other part on a higher, as will be readily understood on inspection.

Similar letters of reference indicate corresponding parts in all the figures.

A A is a fixed casing, made in several pieces to facilitate the putting together and separating the parts.

B is a shaft rotated by the machine which is to be regulated, and which we will in future assume to be a steam-engine.

M^1 M^2 are wheels fitted on the shaft B, and compelled to turn therewith. There are corresponding wheels mounted on another shaft, C, parallel to the shaft B, and there are teeth on the surfaces of both.

The wheels N^1 and M^1 are set a little ahead of the wheels N^2 M^2.

There is a fixed casing, A^1, interior to the main casing A, which incloses about one-half of the periphery of the wheels. There is also a thin portion, A^2, of fixed frame-work between the wheels M^1 and M^2, and the same also between the wheels N^1 and N^2. The central partition A^2 and also the inner faces of the casing A^1 are properly fitted to allow the parts to be put together and separated with facility, and also to allow the water or oil to work with freedom and success, even with some imperfections in the workmanship of the wheels.

The function of the wheels M^1 M^2 N^1 N^2 and their adjacent parts is that of a very smoothly and rapidly-acting rotary pump, the power for which is received through the shaft B as before provided. We partially fill the interior casing A with water, oil, alcohol, glycerine, or other suitable fluid.

The action of the pump forces up the fluid (which we will in future designate as oil) with a velocity exactly corresponding to the velocity of the motor.

A plunger, D, is fitted to work easily up and down in a subcasing, A^3, within the upper part of the casing A. It is attached by the ring *d* to the ordinary connecting mechanism leading to the throttle-valve, the cut-off adjustment, or other controlling means for effecting the changes of motive force in the engine.

The peculiar pump described discharges its oil upward into the lower part of the subchamber A^3. There is a passage, E E, leading from the base of this subchamber A^3 back into the main chamber A. This passage is controlled by an adjustable cock or valve, F.

Above the top of subchamber A^3 is a subchamber, A^4, completely surrounding the plunger D. It connects with the main chamber A by a passage, G. The plunger D fits very loosely in its inclosing case, and there is necessarily a constant leakage or flowage of oil upward through the thin space thus provided. The oil thus leaking upward is gathered in the chamber A^4 and returned through the passage G into the main chamber A.

The action of the machine will now be readily understood. The peculiar pump described, which we will designate generally by the letter M, and which will be understood to include the double series of tooth wheels, arranged as described with their inclosing and separating casings A^1 A^2 and the shafts B and C, receives the oil at the bottom from the chamber A, and discharges it upward into the chamber A^3 with a velocity exactly proportioned to that of the engine.

A portion of the oil flows upwardly around the plunger into the chamber A^4, and falls back through the passage G, performing no useful function save that of reducing the friction of the plunger to a merely nominal amount. This portion will be practically uniform under all conditions. Another portion of the oil flows back through the passage E and cock F. This depends on the adjustment of the cock, and will be practically uniform with any given adjustment. It is intended to adjust this cock to attain any desired rate of speed of the engine, and also to compensate for any gradual increase of flowage up into the chamber A^4, which may result from wear, or again to compensate for any decrease in such flow, which may result under some conditions from a thickening of the fluid. In other words, the cock F, adjustable by hand, gives the engineer the power at any time, by a simple movement thereof, to increase or diminish the ordinary speed of his engine within wide limits.

Meantime, all the short and sharp or long and slow variations in the ordinary conditions which affect the speed of the engine are automatically, and with remarkable promptness and perfection, attended to by the movement of the plunger D, and, consequently, of the throttle-valve or other controlling device.

The moment the engine commences to run above its ordinary speed, even for a quarter of a revolution, the oil is delivered into the subchamber A^3 faster than

it escapes, and the plunger D rises and reduces the supply. On the other hand, the moment the speed falls below the ordinary, the plunger D sinks, and increases the supply.

We are aware that a form of governor, known as the Pitcher governor, has been long known, and is, for some purposes, preferred in practice, acting on the general principle of ours. The necessarily slow action of the plunger-pump employed, delivering the oil at intervals instead of constantly, induced a constant dancing-motion of the plunger, which is very illy fitted for some conditions, and especially for moving the adjustable cut-off mechanism of the modern expansive engine. The action of the cut-off comes only at intervals. If the cut-off rod or other adjustable device which controls the action of the cut-off chances to be at the top of its dancing-motion, it induces a shortening of the supply beyond its proper amount. If it chances to be at the bottom of its motion, it induces too great a supply for the next stroke. It will not be necessary to enumerate all the defects of the several previous modifications of this class of governors, further than to show that this is better. We have applied this governor to the engines of a large linen mill, requiring extreme uniformity in the motion, and it has proved eminently successful.

We ascribe great importance to the chamber A^4 and connected passage G. By it we are able not only to allow for the constant and liberal leakage before referred to and the consequent reduction and practical annihilation of the friction of the plunger D, but also to provide an efficient overflow for the oil in the case (always liable to occur) of the fracture of some large part of the mechanism, so as momentarily to force the plunger D above its ordinary extreme elevated position.

Our chamber A^4 and passage G are large enough to carry freely all the oil which can be sent up under any conditions, and our plunger returns immediately back to its place, and is ready to serve as before.

We claim as our improvement in governors for steam-engines and analogous motive-power machines, the steadily delivering pump M, driven by the machine to be regulated, in combination with the plunger D, subchambers A^3 and A^4, and passage G, arranged substantially as represented, the whole controlling and regulating the velocity of the machine, as herein specified.

In testimony whereof we have hereunto set our names in presence of two subscribing witnesses.

H. D. McMASTER.
ABRAHAM DALE.

Witnesses:
WM. VALENTINE,
M. KERMANN.