

(No Model.)

2 Sheets—Sheet 1.

F. H. BALL.
STEAM ENGINE GOVERNOR.

No. 284,164.

Patented Sept. 4, 1883.

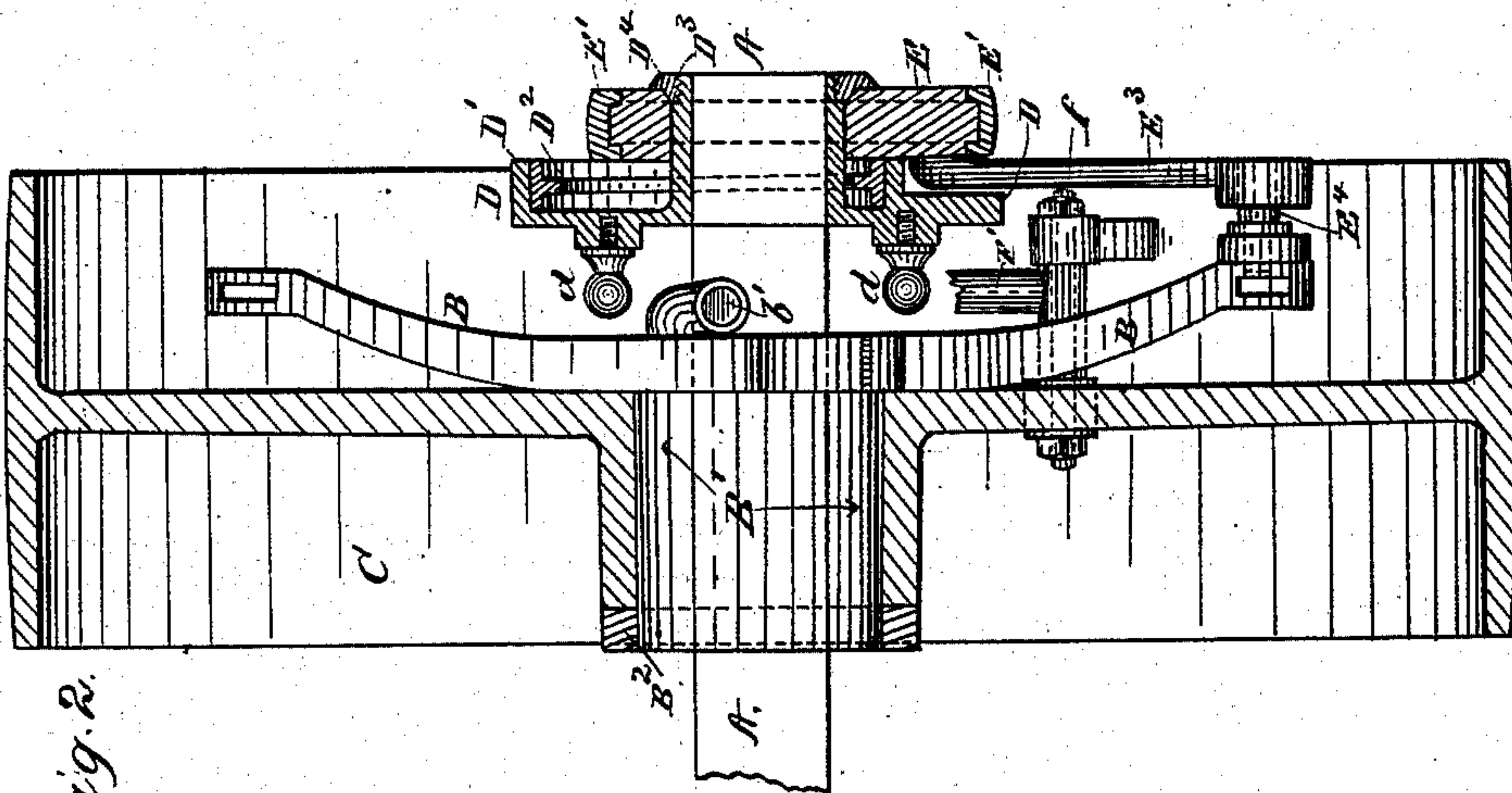


Fig. 2.

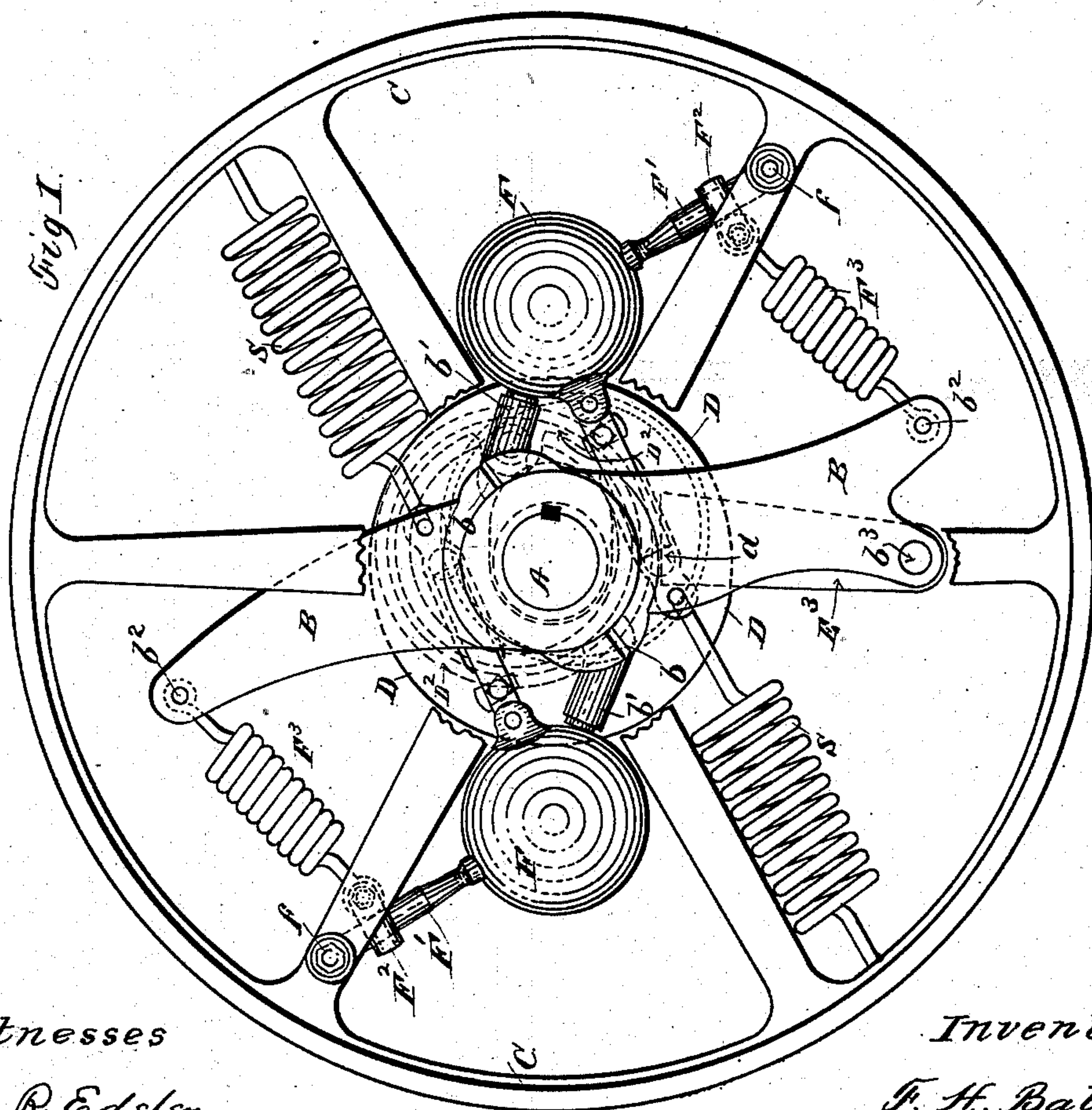


Fig. 1.

Witnesses

W. R. Eddon

Gas. Lange

Inventor

F. H. Ball.

Per H. H. Haller
Att's

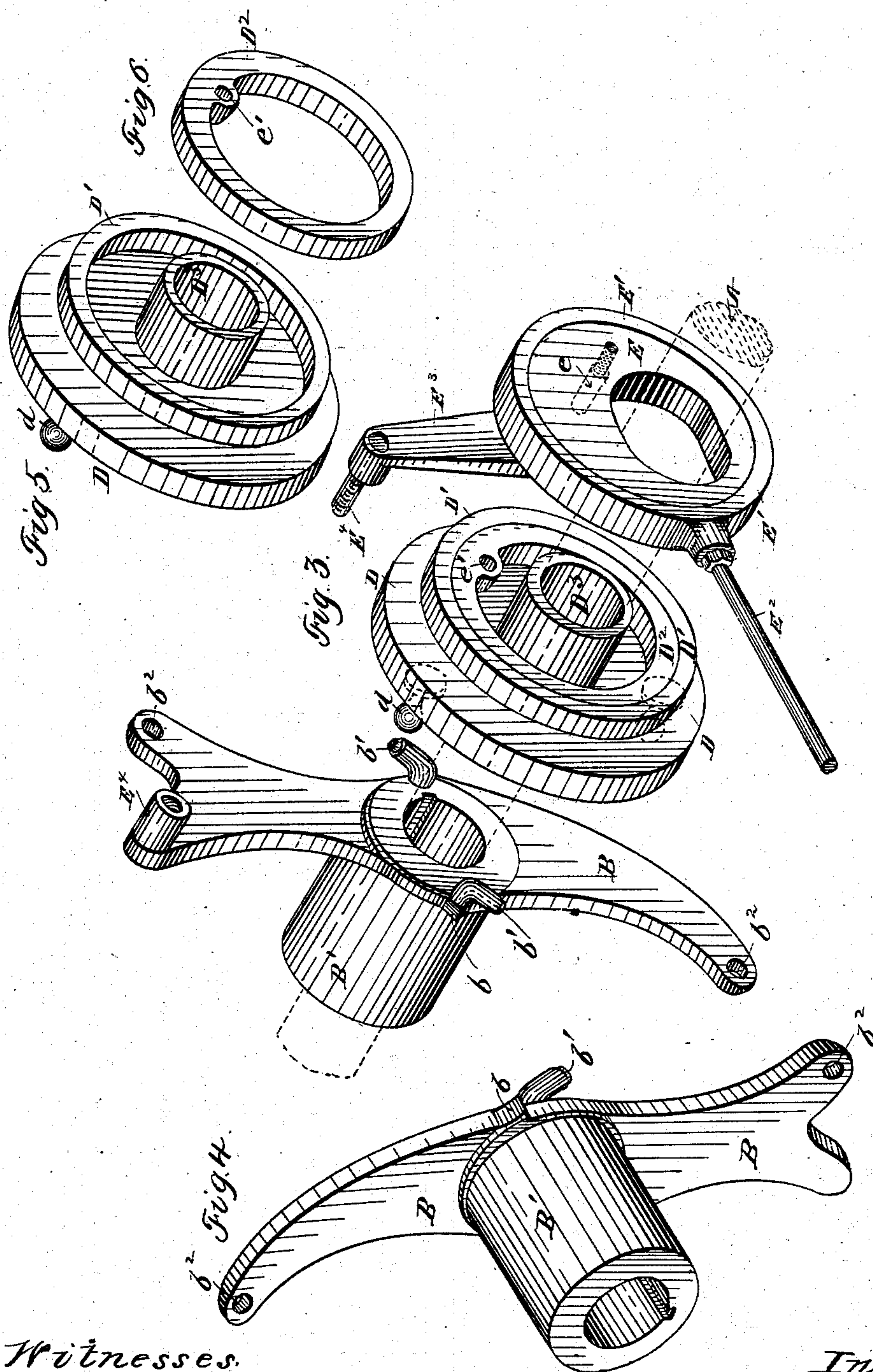
(No Model.)

2 Sheets—Sheet 2.

F. H. BALL.
STEAM ENGINE GOVERNOR.

No. 284,164.

Patented Sept. 4, 1883.



Witnesses.
W. R. Edden. Del.
Jas. Lange.

Inventor
F. H. Ball.
Per Hancock & Hauck
Att's

UNITED STATES PATENT OFFICE.

FRANK H. BALL, OF ERIE, PENNSYLVANIA.

STEAM-ENGINE GOVERNOR.

SPECIFICATION forming part of Letters Patent No. 284,164, dated September 4, 1883.

Application filed December 27, 1882. (No model.)

To all whom it may concern:

Be it known that I, FRANK H. BALL, a citizen of the United States, residing at Erie, in the county of Erie and State of Pennsylvania, have invented certain new and useful Improvements in Steam-Engine Governors; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to steam-engine governors; and it consists in certain new and useful improvements on the construction shown in Letters Patent of the United States No. 261,074, dated July 11, 1882, issued to me.

The object of this invention is to simplify the construction of that class of governors, to provide new parts or appliances, and to generally improve the device, so as to obtain more perfect results.

My device is illustrated in the accompanying drawings, as follows:

Figure 1 is an elevation view, looking from the left of Fig. 2, the arms of the wheel C being broken away to show parts beyond. Fig. 2 is a vertical longitudinal section. Fig. 3 is a perspective view of the parts B D E separated but in their relative positions, the point of observation being from the right of Fig. 2. Fig. 4 is a perspective view of the part B from the opposite side from that seen in Fig. 3. Figs. 5 and 6 show the parts D and D², respectively, in perspective.

A is the engine-shaft. B B' is a cross-arm or frame, which is keyed to the shaft. C is the driving or belt wheel of the engine, and is mounted on the sleeve B' of the frame B B' loosely. D is a disk mounted loosely on the shaft. D' is a flange on the disk D, which forms a female eccentric on said disk. D² is a ring which fits in said female eccentric. D³ is the hub or sleeve of the disk D. E is the valve-eccentric, E' the valve-rod collar, and E² the valve-rod. F F are the centrifugal balls connected by the arms F' to the spokes of the pulley C at f pivotally. F³ F³ are springs which connect the arms F' to the frame B elastically. D² are links which connect the balls F to the disk D, and also connect with springs S S, which are attached to the pulley C, thereby giving an elastic connection between the balls and the pulley or drive-wheel

C. E³ is an arm extending from the eccentric E, and connects pivotally at E⁴ with the cross-arm B. Other letters indicating other parts will be referred to in proper connection hereinafter.

This governor works on precisely the same principle as that in the patent above referred to; but in following the construction there shown I have found that many of the details can be simplified and many crudities corrected, and that many minor parts could be omitted and others re-formed, so as to be more compact. The construction there shown required variation as to size and adjustment of the various parts for various sizes of wheels, thereby requiring a large outlay for patterns, &c., in order to be able to supply the demands of the trade. This difficulty I have corrected in the construction here shown. I also found that it was desirable to provide an elastic connection between the arms of the balls and the cross-arm or frame B, which I have supplied in the springs F³. The explanation of this point is as follows: There are only two points in the revolution of the governor where it can act to move the valve-eccentric; but a change of load may occur when the governor is passing from one of those points to the other, and the balls should move whenever the change of load occurs; but as they could not move without moving the valve-eccentric, they had to wait and hold the extra load until the point in the revolution is reached when the eccentric can move. Now, by providing the elastic connection named—i. e., the springs F³—any change of load occurring while the parts are off the points at which the eccentric can move will be absorbed, I may say, in these springs, and will by them exert its proper function as soon as the proper point is reached. A change of load then can effect its proper change in the relative positions of the drive-wheel and the frame at any time, which change will either add to or take from the tension of the springs F³, and then as soon as the balls can move, and move the eccentric, as they must, they will be effected by this change of tension of the springs F³. In the present construction the balls F are connected by the links D² directly with the disk D, the said links being pivoted on the balls and connected also pivotally by the pins d with the disk. Any centrifugal movement of the balls

will move the disk rotatively on the shaft. The outer face of this disk has thereon a circular flange, D' , and a hub or sleeve, D^3 . The latter is concentric with the disk, and the former is eccentric and forms a female eccentric, into which fits a ring, D^2 , in which is a pin-hole or eye, e' . On the valve-eccentric E is a pin, e , which fits into the hole e' on the ring D^2 . The eccentric E receives its rotary motion by being connected by the arm E^3 with the frame B at E^4 , which connection is also pivotal, and therefore permits the eccentric to swing the length of its elongated shaft-opening. As before stated, the disk D is rolled on the shaft by a movement of the balls centrifugally, and any such movement will cause the female eccentric to roll upon the ring D^2 , which is prevented from moving with it by the pin e . The result is that the eccentric E is swung diametrically, and its eccentricity is changed thereby. All these parts are found in the patent above referred to, but not identical in construction, the present form being much more compact and preferable, the novelty in this instance consisting wholly in the construction shown, the operation and the result of the operation being precisely the same in both cases. One of the beneficial results of this construction is that the eccentric E can be smaller than in the other case. Another is that the device is more compact and looks neater and trimmer and more skillfully done.

The frame or cross-arm B is provided with horn-like lugs $b' b'$, which are hollow at the end and filled with a rubber buffer, and serve as seats or rests for the balls when the engine is at rest. The frame also has lugs $b b$, which abut against lugs on the wheel C at certain times—as, for instance, when the engine first starts up, before the balls have acquired any centrifugal force. These lugs interlock and carry the load until the momentum is sufficient to cause the centrifugal force of the balls to carry it. The pins $d d$, and those also on which the arms F' of the balls are pivoted at f , are so formed as to form a ball-and-socket joint, so as to prevent any lateral binding in those joints.

The connection of the spring F^3 with the arms F' at F^2 is made by a clasp or clamp, (F^2 being a clasp or clamp,) so that it can be properly adjusted to or from the pivot f , as required to obtain the best adjustment.

Any size of wheel C may be used. If one larger than that shown is used, the pivot f would be farther from the rim than in the present case.

I am aware of the patent to L. G. Skinner, dated October 17, 1882, No. 266,214, wherein the fixed frame and the loose pulley are connected together by a spring. I do not claim as my present invention anything therein shown. In my construction the fixed frame and the loose pulley are connected together through the centrifugal moving parts of the

governor, while in Skinner's device the connection is direct.

What I claim as new is—

1. In a governing apparatus for steam-engines, substantially as shown, the combination, with the fixed cross-arm or frame B and the centrifugal governing apparatus, of a flexible or yielding connection between said frame and the centrifugally-moving parts of said governing device, substantially as and for the purposes set forth.

2. In a governing apparatus for a steam-engine, substantially as shown, a frame or cross-head fixed upon the shaft, a drive-wheel mounted loosely on the shaft, a valve-moving gear, also mounted loosely on the shaft, centrifugal balls pivoted to said drive-wheel, and having their arms connected with said frame or cross-head, so as to resist their centrifugal movement by a flexible or elastic connection, and having also a connection with the said valve-moving gear, so as to move said gear as they move centrifugally, all said parts being combined and arranged to operate substantially as shown.

3. In a governing apparatus for steam-engines, substantially as herein shown, the centrifugal balls hung on the drive-wheel, which is loose on the shaft and connected with a frame which is fixed on the shaft by an elastic connection, which is arranged substantially as shown, whereby the motion of the shaft is communicated to the drive-wheel through the said frame, the elastic connection, and the arms of the centrifugal balls, as shown.

4. In the governing apparatus of a steam-engine, the combination, substantially as shown, of the fixed frame B , the loose wheel C , the balls F , pivoted by their arms F' to the loose wheel, and connected by said arms with the said frame B by the springs F^3 , the disk D , connected with said balls by the links D^2 and with the loose wheel C by the springs S , and bearing the eccentric D' , and finally the valve moving eccentric E , connected with the frame B by the pivoted arm E^3 and with the eccentric D' by the pin e and ring D^2 .

5. In a steam-engine-governing apparatus, substantially as shown, the disk D , with female eccentric D' on its face, and the contained ring D^2 , in combination with the slotted eccentric E , the arm E^3 , and the pin e , and the pin-hole e' in the ring D^2 , all substantially as shown.

6. In a steam-engine-governing device, substantially as shown, the arm or frame B , provided with lugs or catches, b , for engaging or clutching the drive-wheel C , substantially as and for the purposes set forth.

In testimony whereof I affix my signature in presence of two witnesses.

FRANK H. BALL.

Witnesses:

JNO. K. HALLOCK,
ROBT. H. PORTER.