(No Model.)

F. BERNARDI.

DOUBLE ACTING HYDRAULIC ENGINE.

No. 507,405. Patented Oct. 24, 1893.

Fig. 1.

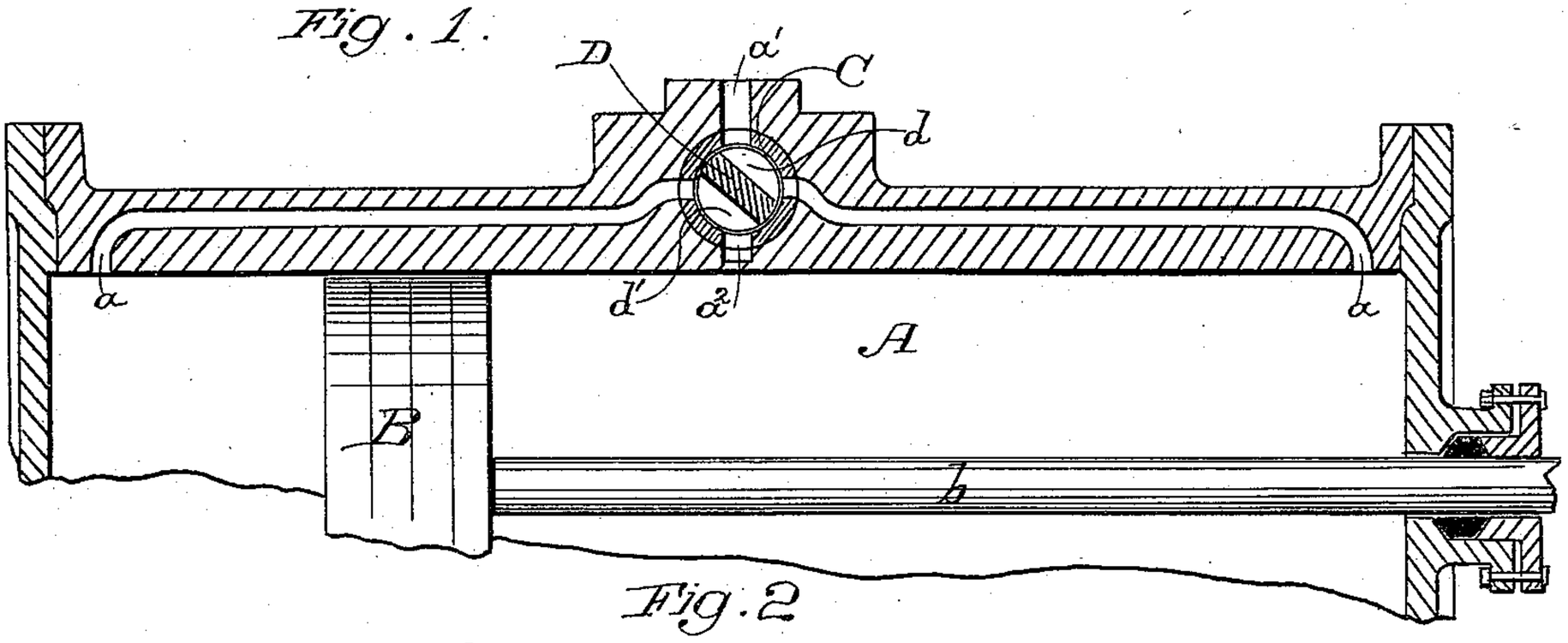


Fig. 2

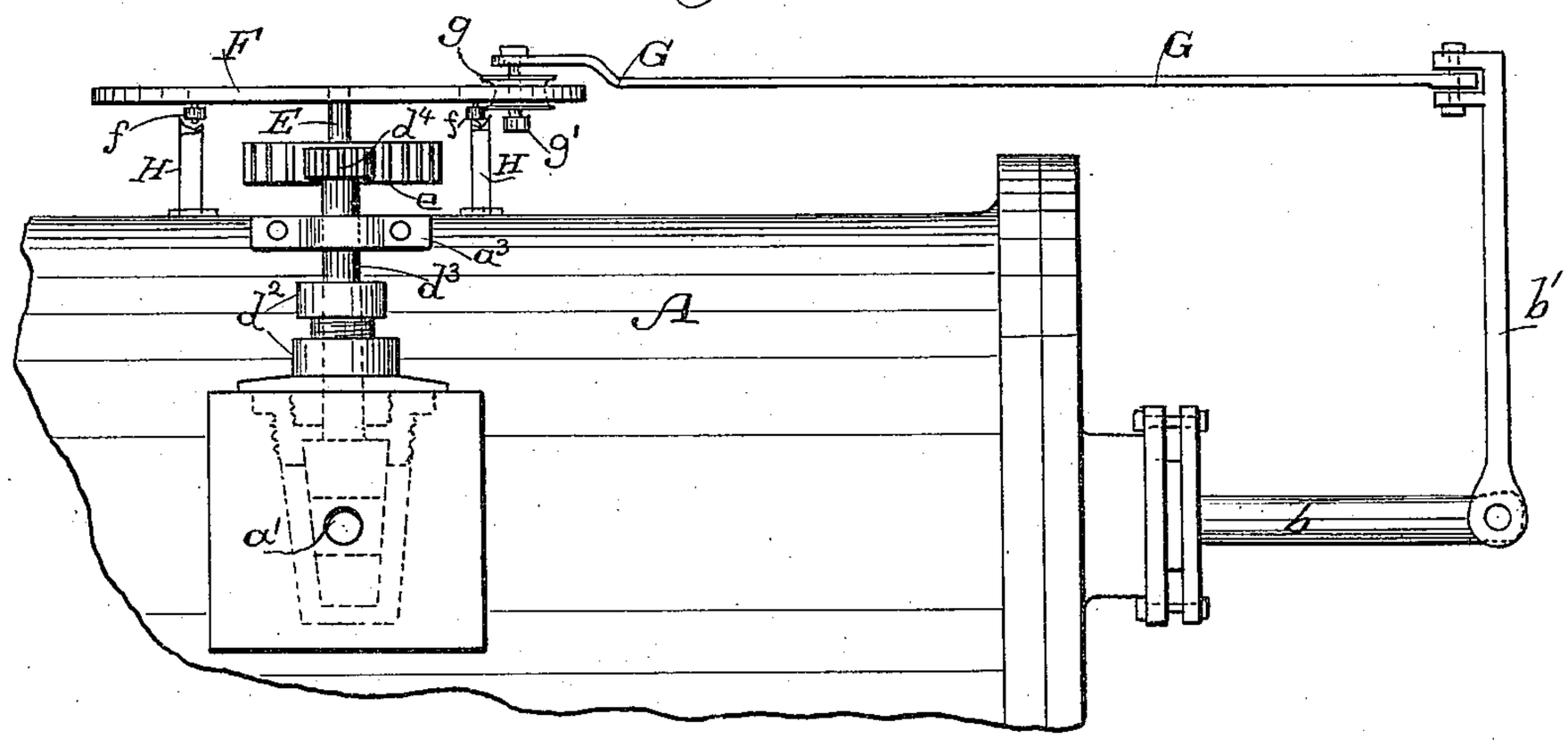


Fig. 3.

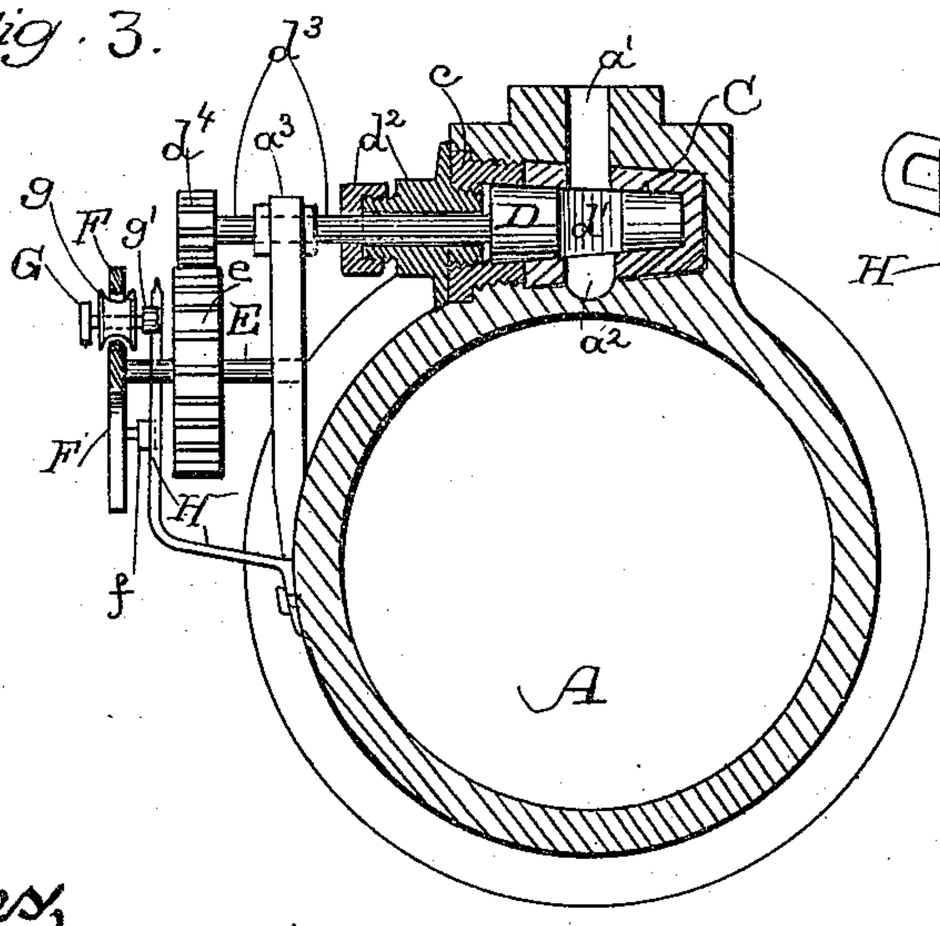
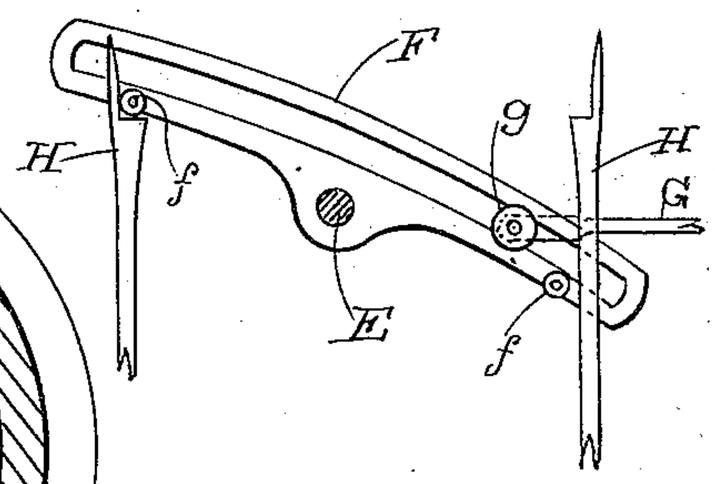


Fig. 4



Witnesses,
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UNITED STATES PATENT OFFICE.

FRANK BERNARDI, OF MOKELUMNE HILL, CALIFORNIA.

DOUBLE-ACTING HYDRAULIC ENGINE.

SPECIFICATION forming part of Letters Patent No. 507,405, dated October 24, 1893.

Application filed June 5, 1893. Serial No. 476,656. (No model.)

To all whom it may concern:

Be it known that I, FRANK BERNARDI, a citizen of the United States, residing at Mokelumne Hill, Calaveras county, State of California, have invented an Improvement in Double-Acting Hydraulic Engines; and I hereby declare the following to be a full, clear, and exact description of the same.

My invention relates to the class of hydraulic engines, and it consists in the novel valve gear, and other details of construction, all of which I shall hereinafter fully describe and specifically claim.

The object of my invention is to provide a simple and efficient engine adapted to be driven by water under head or pressure, and to be used for transmitting power to other machinery, such, for example, as pumps.

Referring to the accompanying drawings for a more complete explanation of my invention,—Figure 1 is a longitudinal section of the upper portion of the cylinder. Fig. 2 is a plan of my engine. Fig. 3 is a cross section in the plane of the valve. Fig. 4 is a detail of the rocking lever F.

A is a cylinder having passages *a* opening into its ends, a water inlet *a'* and a discharge a^2.

B is the piston, and *b* is the piston rod.

C is a valve seat which is removably fitted to the cylinder, whereby when worn it can readily be removed, and another substituted. It is held in place by the gland nut *c*. In the seat is fitted an oscillatory valve D having a port *d* on one side which controls the water inlet *a'* and the two passages *a*, and a port *d'* on the other side which controls said passages and the discharge a^2. This valve is held to its seat by suitable nuts d^2, and its projecting stem d^3 is mounted in a bracket a^3 and carries on its extremity a pinion d^4.

Mounted in a bracket a^3 is a short countershaft E, which carries a gear *e* meshing with pinion d^4. The end of this shaft also carries a rocking lever F which is best of a curved shape and longitudinally slotted as shown. To the piston-rod *b* is firmly secured an arm *b'*, to the end of which is jointed or hinged a rod G, said rod having in its other end a roller *g* which is fitted to and travels in the slotted rocking lever F.

H are two spring catches, with the shouldered heads of which pins *f* on lever F are adapted to successively engage. Upon the end of rod G is also a small contact *g'* which is adapted to successively push the spring catches out of engagement with pins *f*.

The operation is as follows: Water, under head or pressure is admitted through the inlet *a'* and according to the position of the valve is admitted at one end of the cylinder and discharged from the other. The valve is automatically operated by the roller *g* which being moved back and forth with the piston-rod, rocks the lever F, the movement of which, through the gear and pinion, oscillates the valve stem. The rocking of the lever F takes place only at the ends of the stroke, the roller *g* traveling freely in the lever, its rod G moving up and down on its hinge connection with the piston-rod arm *b'*. But upon arriving at the end of the stroke the small contact *g'* coming against the spring catch, which during the stroke had by its engagement with the pin *f* held the lever firmly, will throw said catch from its engagement, and the lever being relieved, will rock under the weight of the roller *g* and rod G, thereby turning the valve. The other end of the lever will now be engaged and held by the other spring catch, which in turn will be released by the return of the contact *g'*.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In an engine and in combination with its cylinder having inlet, discharge and passages and the piston in the cylinder, the oscillating valve having a stem, a longitudinally slotted rocking lever for oscillating the stem, catches for holding the lever at the limits of its movement, a swinging roller operating on said lever and connected with the piston rod, and a traveling contact carried by the connection from the piston rod for alternately releasing the catches, substantially as herein described.

2. In an engine and in combination with its cylinder having inlet, discharge and passages, and the piston in the cylinder, the oscillating valve having a stem, a curved rocking lever, a shaft on which said lever is mounted and gearing between said shaft and the stem of the valve, catches for holding the lever at the limits of its movement, a swinging roller op-

erated on said lever and connected with the piston rod, and a traveling contact carried by the connection from the piston rod for alternately releasing the catches, substantially as herein described.

3. In an engine and in combination with its cylinder having the inlet, discharge and passages and the piston in the cylinder, the oscillating valve having a stem, a rocking lever for oscillating the stem, said lever having the pins *f*, the catches for alternately engaging said pins to hold the lever, the swinging rod connected with the piston-rod and having a roller operating on the rocking lever, and the contact on said swinging rod for tripping the catches, substantially as herein described.

In witness whereof I have hereunto set my hand.

FRANK BERNARDI.

Witnesses:
S. H. NOURSE,
H. F. ASCHECK.