J. HASTIE.

Self-Adjusting Crank.

No. 220,375. Patented Oct. 7, 1879.

FIG. 2.

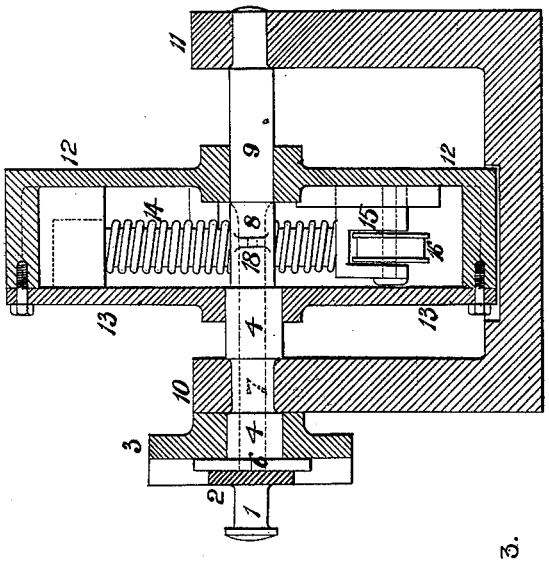


FIG. 3.

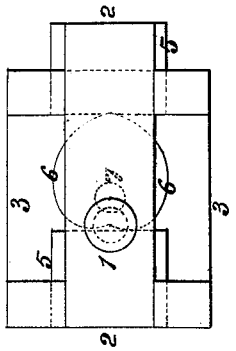
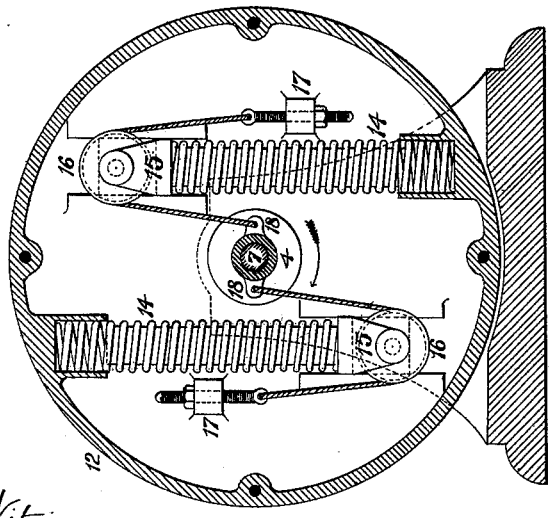


FIG. 1.



Witnesses

Harry Smith

Inventor

John Hastie

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UNITED STATES PATENT OFFICE.

JOHN HASTIE, OF GREENOCK, COUNTY OF RENFREW, SCOTLAND.

IMPROVEMENT IN SELF-ADJUSTING CRANKS.

Specification forming part of Letters Patent No. **220,375**, dated October 7, 1879; application filed June 23, 1879; patented in England September 11, 1876.

To all whom it may concern:

Be it known that I, JOHN HASTIE, residing at Greenock, in the county of Renfrew, Scotland, have invented an Improved Self-Adjusting Crank, of which the following is a specification.

My invention, for which I obtained British Letters Patent, dated 11th September, 1876, No. 3,561, has for its object the economizing of the water used in hydraulic motive-power apparatus, and is applicable with special advantage in cases wherein the resistance is variable.

A water-driven engine, as hitherto constructed—with a cylinder and piston, for example—has to be made at least large enough for the maximum power intended to be developed by it, while on less than the maximum power, with a given speed being required from it any time, the cylinder has still to be filled at each single stroke, and thus more water has to be used than is really required for the diminished power.

My invention consists in avoiding the waste referred to by arranging the parts to which the piston is connected so that the length of the piston's stroke becomes automatically adjusted to suit the power at any time.

In the drawings, Figures 1 and 2 are vertical sections, as at right angles to each other, and Fig. 3 is a face view of the crank-pin with the parts in immediate connection with it.

The change in the length of stroke of the piston or pistons of the engine is, by my invention, obtained by changing the distance of the crank-pin to which the piston or pistons are connected from the center of the first-motion shaft driven by it or them, and as all the parts by which my invention is carried out are in connection with the crank-pin and first-motion shaft it is not necessary to show any other parts of the engine in the drawings, such other parts being arranged in any suitable known way. The crank-pin 1 is fixed to a slide or plate, 2, fitted to slide in guides across the face of a crank-plate, 3, formed or fixed on the end of the first-motion or crank shaft 4, which is tubular. The crank-pin slide 2 is formed with cross-bars 5 on its inner side, which bars bear against opposite edges of a heart-shaped cam, 6, fixed on the end of an internal shaft, 7, passing through the tubular first-motion shaft 4, and indicated by dotted lines in Figs. 2 and 3. This first-motion shaft 4 terminates at a point, 8, but may be said to be continued in a shaft, 9, made in the same piece with or fixed to the internal shaft, 7, but of larger diameter, the combination of shafts 4 9, which are in one line, being carried in bearings 10 11. On the shaft 9 there is fixed a hollow drum or pulley, 12, the cover 13 of which is loose on the shaft 4. The power of the engine may be transmitted from this pulley 12 by means of a belt, or it may be transmitted in any other convenient way from the shaft 9. Inside the drum 12 there are two (or it might be more) helical springs, 14, which act expansively between sockets formed in the drum and blocks 15, fitted with pulleys 16, round which cords (or it might be chains or wire ropes) pass, one end of each cord being adjustably fixed to lugs 17, formed on the drum, and the other to lugs 18, formed on the inner end of the tubular shaft 4.

If the drum 12 is held or resisted by a certain strain while the tubular shaft 4 is turned in the direction of the arrow in Fig. 1, the cords become wound on the tubular shaft and the springs 14 thereby compressed, and at the same time the movement of the tubular shaft 4 relatively to the internal shaft, 7, makes the cam 6 move the crank-pin plate 2 so as to shift the crank-pin 1 outward from the center. The relative movement of the parts will go on until the strain of the springs 14, due to their compression, balances the resistance to the rotation of the pulley 12, and this relative movement, by increasing the throw of the crank-pin 1, will increase the stroke of the piston or pistons acting on it and the consequent expenditure of water for each stroke. A consideration of the described actions of the parts will make it plain that the length of stroke and consequent expenditure of water must correspond to the resistance to be overcome by the machine.

If the resistance varies, the throw of the crank-pin will be correspondingly adjusted by the automatic action of the parts, as an increase in the resistance will cause more com-

pression of the springs 14 and further relative movement in the direction to move the crank-pin farther from the center, whereas when a diminution in the resistance occurs the springs will re-expand and produce the reverse relative movements of the parts, and thereby shorten the throw of the crank-pin and the stroke of the piston or pistons.

What I claim is—

In hydraulic motive-power apparatus, operating by reciprocating pistons or equivalents, the crank-pin, movable to and from the center by a cam on a shaft receiving motion from the crank-shaft through springs, on which the greater or less strain, due to the resistance, acts to produce relative movements of the parts and consequent adjustment of the crank-pin by the cam, substantially as and for the purposes herein set forth.

JOHN HASTIE.

Witnesses:
EDMUND HUNT,
LOCK MOORE.