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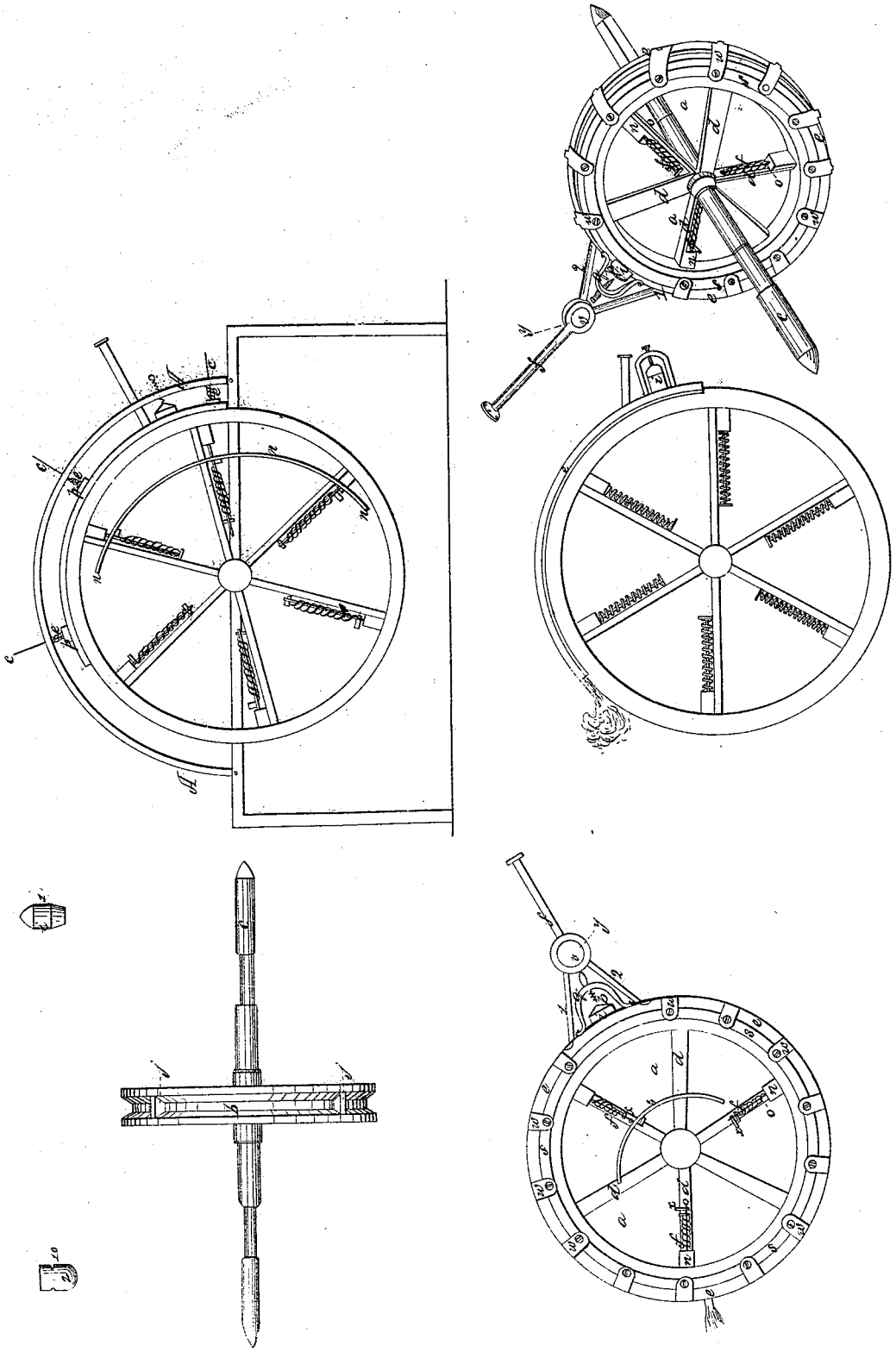
R. M. SHERMAN.

ROTARY STEAM ENGINE.



UNITED STATES PATENT OFFICE.

R. M. SHERMAN, OF FAIRFIELD, CONNECTICUT.

ROTARY STEAM-ENGINE.

Specification of Letters Patent No. 177, dated April 25, 1837.

To all whom it may concern:

Be it known that I, R. M. SHERMAN, of Fairfield, Connecticut, have invented Improvements in Rotary Steam-Engines, of which the following is a specification.

The machine consists of the following parts in the following arrangement: A wheel (Plates I and II, *a*) with a steam chamber (Pl. I, II and III, *b*) connected with its shaft (Pl. II, *c*) by spokes (Pl. I and II, *d*, *d*.) The steam chamber is like a circular open trough, with sides and bottom united. The bottom of the chamber is toward the shaft. The wheel and chamber revolve with the shaft when the machine is in operation. Over the chamber, or as much thereof as is filled with steam, is a cover or cap (Pl. I, II, and IV, *c*, *c*, *c*,) carefully fitted to the top of the chamber, but slightly, if at all, in contact with it. Through this cover, the steam is let into the chamber by a pipe from the boiler (Pl. I, II, and IV *f*,) and after passing the necessary distance therein, escapes, (Pl. I, II, and IV, *h*,). Near the place where the steam enters is a stop or head (Pl. I, II, III, and IV, *i*) which fills a few degrees of the chamber, so as to cover the recesses hereinafter mentioned, and make the chamber impervious to steam at the place where this stop is located. The steam in passing through the chamber operates on valves which rise up through the bottom of the chamber at right angles therewith, by means of springs (Pl. I, and II, *b*, *b*, *b*,) of a spiral, elliptic, circular or other proper form. In machines of great power the circular or elliptic will be preferable to the spiral, which is represented in the drawing referred to. The springs may operate on the rods to which the valves are united from a fixture (4) on a spoke or arm of the wheel; or from the shaft; or from the opposite side of the chamber, so as to protrude the valves through the bottom of the chamber and cause them to press on the cap, to which their tops are exactly fitted. In the sides of the chamber (as at *j* Pl. III) are grooves in which the valves slide when rising and falling. The face of each valve is pressed by the steam against the grooves. Under the chamber are recesses (Pl. I and II, *w*, *w*, *w*,) fitted to the forms of the respective valves, into one of which each valve sinks when passing the stop. The rod (Pl. I and II, *o*, *o*, *o*,) connected with each valve, passes through the bottom of the recess, and is constantly pressed upward by the spring. The orifice in which the rod passes through the bottom of the recess, may be secured by a packing box; but this will seldom be necessary in a well made machine, while it is new. The stop is stationary, being held by the cap. It must have breadth enough to cover the recesses above mentioned. It may be made in various forms. One mode of construction is, to shape a piece of metal to the sides and bottom of the chamber (see Pl. III, Figure 1) ground so as to fit with exactness. This is inserted through the cap into the chamber, and rises above the cap, as in plate I and II *i*. As the stop and cap are both stationary, the orifice through which the stop is inserted may be packed, so as to prevent the escape of steam. The stop is pressed downward constantly against the bottom of the chamber, by a screw (*v*) operating on a spring (*p*) which presses on the stop. This screw operates through a piece of metal which stands over the stop, the ends of which are secured to the cap. (Pl. II and III, *r*, *p*, *q*.) The chamber should be a little narrower at the bottom than at the top, as in plate III, so that the wear of the stop by its friction against the bottom and sides of the chamber may be compensated by the pressure of the springs and therefore not occasion the escape of steam. The pressure of the spring is intended to supersede the necessity of hemp, or other fibrous packing.

When the valves pass the stop they are made to sink down into the recesses by means of a cam or eccentric. The apparatus for this purpose may be variously constructed. One mode is the following: On the bottom of the rod, below the orifice of the above mentioned fixture through which it passes, is a foot (Pl. I and II *x*) which stands out at right angles with the plane of the wheel's motion. The cam or eccentric (Pl. I 3) is fixed to the frame to which the machinery is attached, and is near the shaft. Under this the foot passes, and such is the form of the eccentric, that it draws down the valve as the foot slides along beneath it, so as just to pass under the stop, and then permits it to rise by the pressure of the springs, gradually, so as to occasion no shock in a rapid revolution, and again press on the top of the chamber after passing the place of the entrance of the steam. If the cam or eccentric is double, that is, if there is one on each side of the wheel, and the foot passes

through the rod, extending under each cam, the pressure will occasion less friction, and be more exactly in the direction of the motion to be given to the valves. Or the cam or eccentric may be fixed to the frame or to the cap, and be placed at a distance from the shaft. In such case, a pin, which passes under the cam, projects from the rod at the top of the spiral spring. When the cap covers but a small part of the chamber, say 120 degrees, or a less number the cam should always be at a distance from the center. In each case the passage of the foot or pin, under the cam, may be facilitated by a friction roller H. The faces of the valves are exactly fitted to the grooves in which they slide, and to the apertures into which they sink, so far as they are in contact. Against these grooves and apertures the valves are pressed by the steam. They are pressed against the cap also, by the springs. By means of these pressures, the passage of the steam by the valves is prevented, and its whole force spent in producing a revolution of the wheel.

Where the machine is made to reverse its revolutions, as is necessary when applied to certain purposes, the steam pipe divides into two branches, one of which enters the chamber on each side of the stop. (Pl. I and II, *g*. 1 and 2.) At the dividing point is placed a cock (Pl. I and II *v*, *v*,) in an orifice, the upper part of which constitutes a small chamber for steam. Through the cock is a hole 10; and if this hole by the turning of the cock, is made to enter the branch 1, the wheel will revolve in one direction; and if made to enter the branch 2, it will revolve in the other. The cock is moved by the lever *y*. If the number of valves is given, the cap must cover double the number of degrees of the chamber of a wheel which revolves in both directions that it needs to cover of one which revolves in one direction only. If there are four valves, and the wheel is made to revolve only one way, a cap covering one-third of the chamber will be enough; and if there are six valves the cap needs to cover 90 degrees only. See Plate IV. The cap should be secured to the same frame on which the journals of the shaft rest. When it does not exceed a third part of the circle it may be fitted to the frame with screws by which it may be raised and lowered at pleasure, at either end, and adapted to the chamber with precision, so that little if any steam can escape between them. If the cap be made to press by springs upon the top of the chamber by means of an arch of corresponding figure placed above it, or any other way this elastic pressure will prevent the escape of steam where the cap and chamber come in contact, and supersede the necessity of the packing rings hereafter described. See Plate V. But to prevent the escape of steam between the chamber and the cap, a lateral metallic packing may be applied of the following structure: Grooves are made in the outside of the cap and chamber so as to constitute but one groove about the middle of which is the line of contact, between the cap and chamber. In this groove and over this line of contact a circular flat piece of metal is placed, (Pl. I and II *s*, *s*, *s*,) which is so ground as to fit the contiguous part of the chamber. This is called the packing ring. The groove should be a little deeper for the reception of this ring on the cap than on the chamber. Where it is in contact with the cap, as both are stationary, it may be packed with hemp. Springs are then made to bear laterally against the packing ring, so as to keep it in close contact with the chamber, and thereby prevent the escape of steam. These lateral springs may be variously constructed. One mode is to affix a series of springs called cramps, to the top of the cap, which shall cross it at right angles, and passing a convenient distance beyond its sides, be so shaped that their ends may come over against the packing rings. Through each of these ends passes a screw bolt, so as to press against the ring. This may be made to press more or less as may be found necessary; and the elasticity of the spring will so accommodate the pressure to the movements of the machine, that little friction will be occasioned. (See Pl. I and II, *w*, *w*, *w*.) The cramps may be fixed to the cap by screws; or flanges may be made for the purpose on the edges of the cap, to which they may be bolted. The cramps may be made inflexible, and semi-elliptic springs be interposed between the screw bolts and the packing rings, as in the aforesaid model. Each ring may be kept stationary by one or more pins passing through it into the cap. On that part of the groove which is made in the cap, and which, as already stated, is a little deeper than that on the chamber. The ring rests on a bed of hemp, or other elastic substance impervious to steam, so that it may yield some to the pressure of the lateral springs, and be kept in as close contact with the chamber as may be found necessary.

Oil may be infused to lubricate the interior parts of the machine at any point where there is no pressure of steam. Where all the chamber is not occupied by steam, oil may be introduced beyond the point of exhaustion.

A condenser may be employed for the same purpose in this as in the reciprocating engine.

The machine should be inclosed in a jacket of sheet iron or copper to carry off the steam from the apartment in which it is used.

Motion may be communicated to other machinery from the shaft of this engine, by a crank, bands, or cog-wheels, or any other means appropriate to the object.

I do not claim as my invention the valves and rods, nor the raising thereof by springs, nor the packing rings, nor the recesses or cases into which the valves or pistons sink when withdrawn from the steam chamber; but I do claim as my invention and improvement the following particulars in combination with the rotary steam engine, viz:

1. The grooves in which the valves or pistons rise and fall in a revolving chamber, together with the mutual adaptations to each other of the said valves and grooves, and of the said valves and apertures, where their respective surfaces come in contact so as, without the use of hemp or other packing, and by means of pressure on said valves of the steam itself, to prevent the passage or escape of steam by the sides and bottoms of the valves.

2. Such an adaptation of the tops of the valves to the cap, as by the pressure of the springs by which they the raised, will, without the use of packing, prevent the passage of steam between the valves and cap.

3. The application of a pressure by means of a spring upon the stop, whereby it is made to bear against the sides and bottom of the chamber in such manner as to to prevent the passage or escape of steam, without hemp or other packing.

4. The combination of the packing rings with lateral springs, operating thereon, so as to prevent the escape of steam between the cap and the chamber without the use of packing; and the pressure of the cap upon the revolving chamber by means of springs, as above stated, to effect the same result.

Fairfield, Connecticut, March 2d, 1837.

ROGER M. SHERMAN.

Witnesses:

EBEN DEMON,

GEO. A. PHELPS.