(No Model.)

G. POORE, C. INGREY & E. LATHAM.

FLUID PRESSURE MOTOR.

No. 345,858. Patented July 20, 1886.

Fig 1

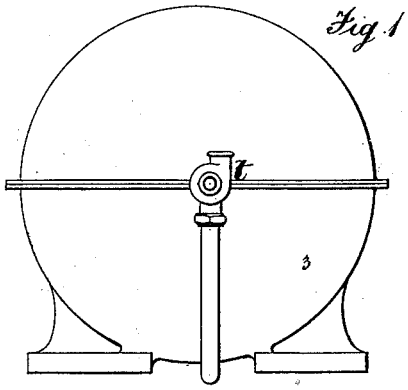


Fig 2

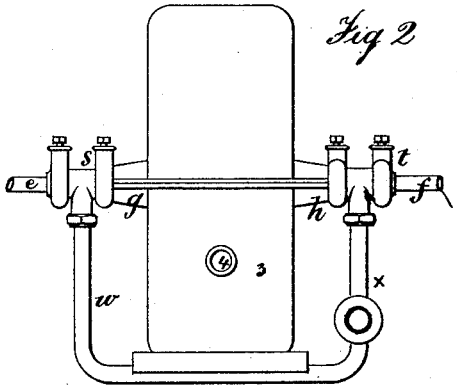


Fig 3

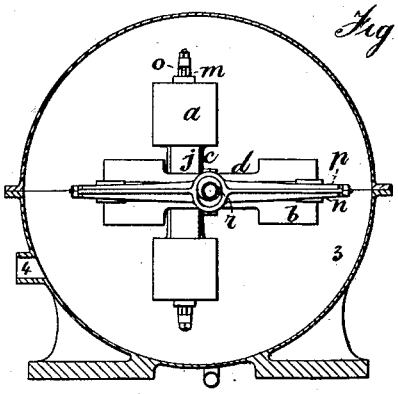


Fig 4

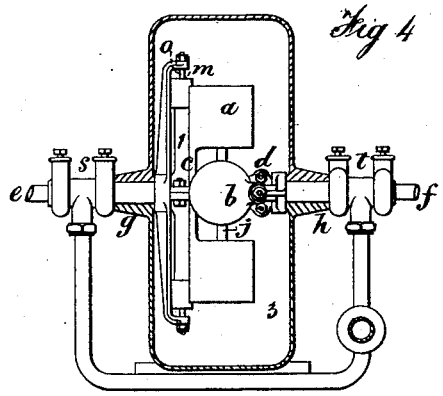


Fig 5

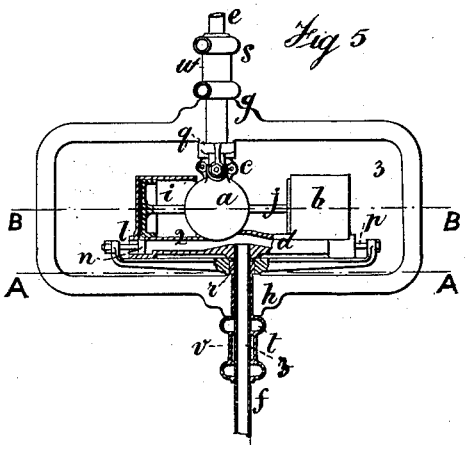
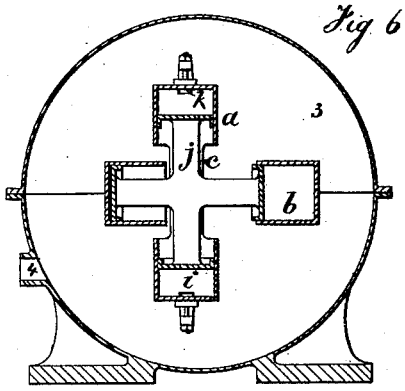


Fig 6



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GRAYDON POORE, CHARLES INGREY, AND ERNEST LATHAM, OF LONDON, COUNTY OF MIDDLESEX, ENGLAND.

FLUID-PRESSURE MOTOR.

SPECIFICATION forming part of Letters Patent No. 345,858, dated July 20, 1886.

Application filed March 23, 1886. Serial No. 196,230. (No model.) Patented in England November 19, 1885, No. 14,196.

To all whom it may concern:

Be it known that we, GRAYDON POORE, CHARLES INGREY, and ERNEST LATHAM, subjects of the Queen of Great Britain, residing at London, in the county of Middlesex, England, have invented a new and useful Fluid-Pressure Motor, (that they have not patented the same in any country, but have applied for Letters Patent of Great Britain, No. 14,196, November 19, 1885,) of which the following is a specification.

Our invention relates to an improved motor to be operated by steam or other motive fluid; and it consists, essentially, in the combination of cylinders, pistons, and shafts or axles to form an arrangement, the motion of which resembles that of the coupling known as "Oldham's Coupling."

In such an apparatus the cylinders are arranged in pairs, with the axis of one pair at right angles to the axis of the other pair. One pair of cylinders is connected to one shaft, the other pair to the other shaft, and the four pistons are formed with or are rigidly connected to a device answering approximately to the cross in Oldham's coupling.

The arrangement of motor we preferably adopt is as follows: The cylinders constituting a pair are placed opposite each other, and are bored out in line. Each pair of cylinders is mounted upon a tubular shaft or axle at right angles to the bore of each cylinder. The two tubular shafts or axles are supported by suitable bearings placed in lines parallel to each other, but at a distance apart equal to one-half the stroke of the engine. The four pistons are connected rigidly together, the axis of one pair being at right angles to the axis of the other pair, so that the two axes intersect and form a cross. When the pistons are in the cylinders, the two pairs of cylinders, although mounted on different centers, occupy positions at right angles to each other, and they are maintained in these relative positions by the connected pistons, the movement of which causes each pair of cylinders to revolve around its center of motion—namely, the axis or shaft to which it is connected. Motive fluid is admitted to the tubular shafts or axles, and passes by means of passages or ports to the cylinders, the admission and escape being controlled by valves, as hereinafter described.

We will now proceed to describe our invention, reference being had to the accompanying drawings, of which—

Figure 1 is a side elevation of our improved motor. Fig. 2 is an end elevation. Fig. 3 is a vertical section through A A; Fig. 4, an end elevation with the casing shown in section. Fig. 5 is a plan with top part of the casing removed. Fig. 6 is a vertical section through B B, showing the two pairs of cylinders with the pistons rigidly connected and forming a cross.

a b are two pairs of cylinders, rigidly connected by brackets *c d* to tubular shafts *e f*. The said shafts are supported by bearings *g h*, which are placed parallel to each other, but not in line, the distance apart of their centers being equal to one-half the length of the stroke of the pistons *i*.

Each pair of cylinders *a b* are bored out in line, and are always maintained at right angles to each other by the pistons *i*, which are rigidly connected to each other by arms or rods *j*, and form an equal-right-angle cross.

The cylinders *a b* are provided with ports *k l*. *m n* are valves for regulating the passage of motive fluid to and from the said ports. The said valves are connected to valve-rods *o p*, which acquire the necessary amount of movement by means of fixed eccentrics *q r*, around which the said valve-rods revolve.

s t are stuffing-boxes, which surround the shafts *e f*, and have annular spaces *u v*, into which motive fluid is received from the pipes.

w x are orifices leading from the spaces *u v* to the interior of the tubular shafts *e f*.

1 2 are passages leading from the tubular shafts *e f* to the cylinder-ports *k l*; 3, casing; 4, exhaust-pipe.

The motor acts as follows: Steam, compressed air, or water or other liquid at pressure is admitted to the cylinders from the tubular shafts *e f* and passages 1 2 through the ports *k l*, uncovered by the valves *m n*, and acts upon a piston. Steam or fluid at pressure acts in one cylinder of each pair at the same time, and causes the pairs of cylinders to revolve each around its respective axis and turn the shafts

e f. When the pistons of one pair of cylinders are, respectively, at the bottom and top of the cylinders, the pistons of the other pair are midway in their respective cylinders, as particularly shown in Fig. 6 of the drawings. After the motive fluid has forced a piston to the end of its stroke, one of the valves *m n* is opened so as to uncover a port, *k l*, and allow the motive fluid to escape into the casing 3, whence it is led away by the exhaust-pipe 4. Either or both of the shafts *e f* can be employed to transmit motion.

It will be obvious that without departing from the nature of our invention several modifications of our improved motor can be made. For instance, the cylinders may be rigidly united in the form of a cross, and the pistons made in pairs and attached to the shafts, thus reversing the arrrangement herein described.

We claim—

1. The combination of two pairs of cylinders, each pair connected by a tubular bracket, and mounted on a tubular shaft, two pairs of pistons having cruciform piston-rod, and suitable supply and exhaust valves, substantially as and for the purposes specified.

2. The combination of cylinders *a b*, brackets *c d*, tubular shafts *e f*, bearings *g h*, pistons *i*, arms or rods *j*, ports *k l*, valves *m n*, rods *o p*, eccentrics *q r*, stuffing-boxes *s t*, spaces *u v*, orifices *w x*, and passages 1 2.

3. In a fluid-pressure motor, the combination of two pairs of cylinders and two pairs of pistons, said devices having a cruciform arrangement, two tubular shafts on which said devices are mounted, said shafts being parallel but not aligned, and suitable supply and exhaust passages and valves, substantially as and for the purposes specified.

4. In a fluid-pressure motor, the combination of two pairs of cylinders and two pairs of pistons connected and having a cruciform arrangement, shafts on which said devices are mounted, fixed eccentrics, and arms which control the valve-rods, and are actuated by the fixed eccentrics, substantially as and for the purposes specified.

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