Jan. 2, 1923.

1,441,135.

J. F. THOMAS.

POWER GENERATING MECHANISM.

FILED APR. 8, 1922.

2 SHEETS—SHEET 1.

Fig 6.

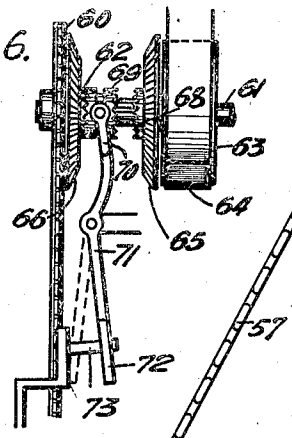

Fig 1.

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By

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2 SHEETS—SHEET 2.

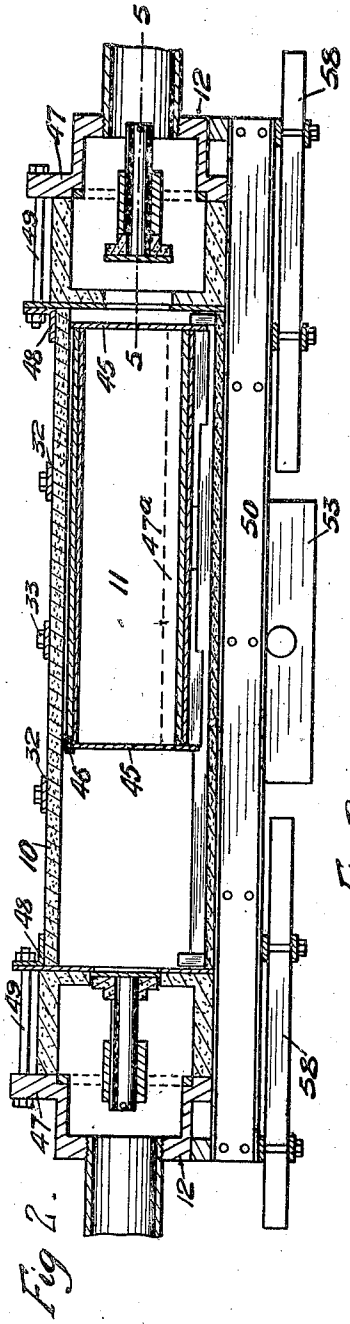

Fig 2.

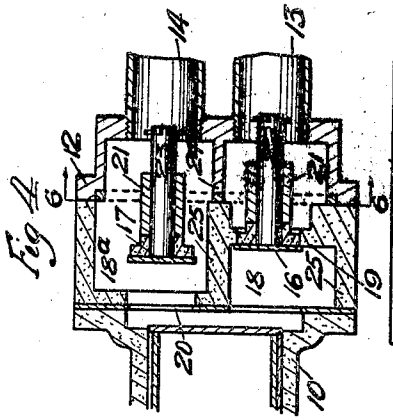

Fig 4

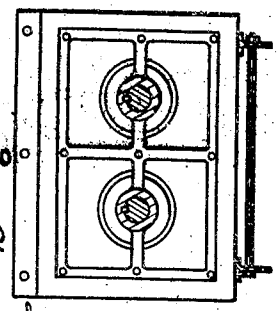

Fig 5

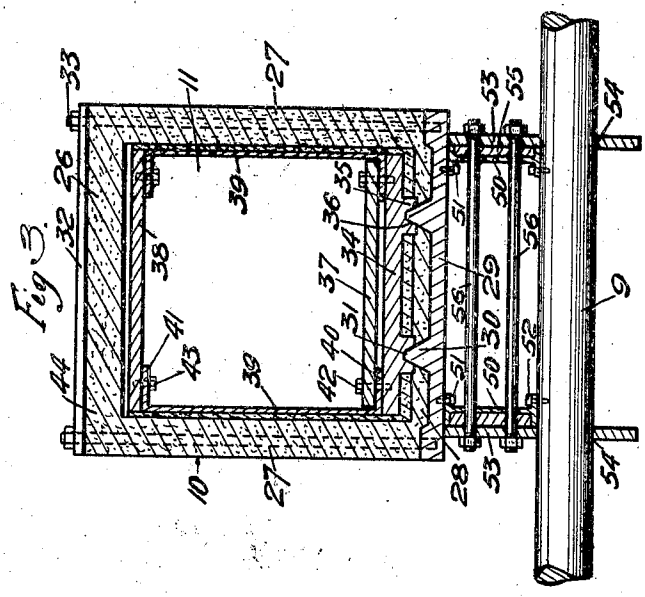

Fig 3.

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Patented Jan. 2, 1923. 1,441,135

UNITED STATES PATENT OFFICE.

JAMES F. THOMAS, OF MONTREAL, QUEBEC, CANADA.

POWER-GENERATING MECHANISM.

Application filed April 8, 1922. Serial No. 550,758.

To all whom it may concern:

Be it known that I, JAMES F. THOMAS, a subject of the King of Great Britain, residing at 23 Overdale Avenue, in the city and district of Montreal, in the Province of Quebec, in the Dominion of Canada, have invented certain new and useful Improvements in Power-Generating Mechanism, of which the following is a specification.

This invention relates to mechanism particularly adapted and constructed for compressing air, elevating or forcing water after the manner of a ram for use in various capacities as a power generating medium, or for general service or supply, and the primary object of the invention is to provide an organization of cooperating instrumentalities and elements, and including an oscillating compressor, which is also equally well usable as a water elevating or forcing means and in which a piston is loosely mounted to automatically and freely reciprocate in opposite directions without restriction, and thereby dispense with piston connecting and actuating devices, relying solely for reciprocation of the piston on the gravitation thereof alternately from one end to the other of the prime compressing cylinder or means to accomplish the desired operation relatively to charges of air or to elevate or force water that may be indrawn into the cylinder, or similarly actuate any other medium to which the improved mechanism is adapted. A still further object of the invention is to simplify and economize in the general construction and organization of devices of this character and at the same time reinforce or strengthen the several parts to withstand wear and tear and the pressures to which the parts may be subjected during the operation of the improved power generating mechanism.

With these and other objects and advantages in view, the invention consists in the construction and arrangement of the several parts which will be more fully hereinafter described and claimed.

In the drawings:

Fig. 1 is a side elevation of a mechanism embodying the features of the invention and including a storage reservoir or tank and showing the prime factor or cylinder in dotted lines in full rocked position in one direction;

Fig. 2 is a longitudinal vertical section through the prime factor or cylinder for compressing or elevating or forcing water;

Fig. 3 is a transverse vertical section through the rocking cylinder showing a part of the rock shaft to which the cylinder is connected;

Fig. 4 is a horizontal action taken on the line 5—5, Fig. 3;

Fig. 5 is a transverse vertical section taken on the line 6—6, Fig. 5;

Fig. 6 is a detail elevation, showing a portion of the shifting mechanism which is automatically operated by the rocking cylinder;

This application embodies features of improvement on the construction disclosed in my pending application, Serial No. 510,917, filed Oct. 27, 1921, for improvements in power generating mechanism, patented September 26, 1922, #1,430,416.

The numeral 5 designates a supporting pedestal or frame comprising opposite members 6 having supporting feet 7, the said members being reduced towards their upper ends to provide means for applying suitable bearings 8 thereto for a rock shaft 9 fixed to a prime operating factor or cylinder 10 having therein a freely movable and operatively unrestrained piston 11 of suitable dimensions and weight. At opposite ends of the cylinder 10 are laterally projecting heads 12, one of which is shown by Fig. 5, these heads being for the attachment of discharge and intake pipes or conduits 14 and 13. The discharge pipe or conduit 14 has a central discharge outlet 15 which will be more fully hereinafter explained with relation to its connection with a storage means or tank located in any suitable position relatively to the said prime factor or cylinder 10. The intake pipe or conduit 13 at each end of the cylinder, or in connection with each of the heads 12, is adapted to be open for the full intake of air or run to a source of supply of water. The discharge and intake pipes 14 and 13 are connected with both ends of the mechanism, or with the two heads 12 of the prime factor or cylinder 10, to adapt the mechanism for reversal of operation or oscillation in a manner which will be more fully explained, and while air and water may be referred to as the mediums preferably acted upon by the improved mechanism in the subsequent description, it will be understood that the improved mechanism is intended to be used with any other mediums or for any specific service to which it may

be adapted. Each of the heads 12, as clearly shown by Figs. 3, 5 and 6, has loosely mounted valves 16 and 17 disposed in operative alinement with the connected terminals of the discharge and intake pipes or conduits 14 and 13 and operating alternately in reverse directions, or, when the valve 16 is open the valve 17 will be closed, and vice versa. Each of the heads 12 is formed with interior chambers 18 and 18ª, and within the chamber 18 is a valve seat 19 of suitable structure for the valve 16, the valve 17 also having a seat 20 in alinement with the connected terminal of the discharge pipe or conduit 14. The valves 16 and 17 are mounted to operate in guides 21 located in rear extensions of the chambers 18 and 18ª, and these valves also have extensions 22 and 23 which are located in the centers of the connected terminals of the pipes 13 and 14. The valves 16 and 17 are free to move, or are unrestricted by springs or other obstructing devices and operate solely through the action thereon of the piston 11 in its reverse movements through the cylinder 10, so that the pressure created by the movement of the said piston towards the valve 17 will open the latter and close the valve 16, and conversely, when the piston moves in the opposite direction it will set up a drawing action on the valve 16 and also on the valve 17, opening the former valve and closing the latter valve. The connected terminal of the discharge pipe 13 relatively to each head 12 is separated from the connected terminal of the intake pipe 14 to the head by an intermediate partition 24, and it is proposed to supply the interior of each head with a filling or wall of suitable plastic material, as at 25, and this plastic structure will be carried out relatively to the valve seats, so that the valves operated upon or contacting or engaging with the said plastic fillings or walls will form their own seats and maintain tight joints relatively thereto. The interior of the cylinder 10 at the top, sides and bottom is likewise provided with walls 26 27 and 28 of suitable plastic material, and the base of the cylinder consists of a metal plate 29 extending full length thereof and applied against the lower plastic wall 28. The metal base plate 29 in the present improved structure is provided with upwardly projecting ribs 30 extending longitudinally thereof on opposite sides of the center, these ribs projecting through the lower plastic wall 28 and having their reduced extremities 31 exposed within the interior of the cylinder 10. The cylinder 10 also has metal straps 32 extending thereacross at intervals and engaging these straps, and extending downwardly through the side plastic walls 27 are tie bolts or rods 33 which are suitably nutted and serve as reinforcing means, the top straps 32 serving to brace and strengthen the top wall 26. It is proposed to introduce in the plastic walls 26, 27 and 28 suitable reinforcing means or devices and also to otherwise reinforce or brace these walls as may be found necessary to maintain the said walls in strong and durable shape. The piston 11 is disposed for operation in the cylinder 10 and is free for automatic reciprocation towards opposite ends of the cylinder when the latter is oscillated in reverse directions. This piston 11 has a lower or bottom plate 34 formed with longitudinal depending ribs 35 having grooves 36 therein, one in each, to receive the upper reduced edges of the ribs 30, the grooved ribs 35 depending a short distance into the bottom plastic wall 28 of the cylinder 10. The piston 11 also has a bottom frame plate 37 extending longitudinally thereof and a similar top plate 38 connected by side angle plates 39 formed with lower and upper inwardly projecting angular flanges 40 and 41, the flanges 40 having the opposite side edge portions of the plates 37 resting thereon and this plate secured by suitable fastenings 42 extending therethrough and through the said lower flanges 40 into the bottom plate 34 of the piston. The upper flanges 41 are secured against the lower side of the top plate 38 by suitable fastenings 43 extending through the said flanges 41 into the top plate, as clearly shown by Fig. 4. The top plate 38 is slightly wider than the bottom plate 37, the opposite side edges of the top plate being flush with the outer surface of the side angle plates 39. Applied around the sides and bottom of the framework of the piston as just explained is a plastic covering or sheathing 44, the ribs 35 projecting below the lower portion of this sheathing for free engagement with the guide ribs 31. The opposite ends of the piston 11 have removable head plates 45 of metal and held connected to the plates 34 and 35 by suitable removable fastenings, as at 46, shown by Fig. 3, the upper edges of the said plates 45 projecting above the upper surface of the top plate 38 to closely engage the top plastic wall 26 of the cylinder 10. In the event of wear and settling of the piston 11 within the chamber of the cylinder 10, any leaking spaces that may be formed between the upper edges of the plates 45 and the top wall 26 of the cylinder may be closed to make a tight slide fit of the piston by applying plastic material to the upper outer sides of the plates 45 and along portions of the upper surface of the plate 38 adjacent to the plates 45. The interior of the piston is free for the introduction of weight devices by removing either one of the heads 45, said weight devices being adapted when used to test the balancing effect of the piston 11, or to increase the weight of the same as the operation of the improved device may require. These weight devices may be of any suitable

form, but are preferably plates, as at 47ª and indicated by dotted lines in Fig. 3. Any number of these plates may be used and they may be constructed of suitable metal. In the preliminary preparation of the cylinder 10 and while the plastic walls 26, 27 and 28 are in such soft condition as to be shaped, the piston 11 will be introduced in the said cylinder and the latter oscillated until the said walls as well as the surrounding plastic sheathing 44 of the piston becomes smooth and have a reasonably tight fitting association. The piston 11 will be free to slide but at the same time the plastic sheathing 44 around the top, sides and bottom of the piston will prevent leakage of air or water between the piston and the walls of the cylinder. This manner of properly shaping and producing a close fit between the sides of the piston 11 and the inner surfaces of the walls of the cylinder 10 through the preliminary sliding actuation of the piston 11 will economize in the structure of the cylinder 10, or avoid expensive dressing operations and measurements, and furthermore, a more perfect conformity of the piston relatively to the inner surfaces of the walls of the cylinder will ensue. It is proposed at any time found necessary and after the sheathing 44 of the piston 11 has worn considerably, to replace the said sheathing as may be found necessary to maintain an air and water tight fitting between the piston and the walls of the cylinder. Both the cylinder and the piston are preferably square in cross section, so as to avoid the least displacement of the cylinder in a lateral direction, and the reduced ribs 30 and grooved ribs 35 serve to hold the piston true in its oscillation and reduce the friction to a minimum and at the same time equalize the wear on the sheathing in the piston and the inner surfaces of the walls of the cylinder.

The heads 12 are secured to the ends of the cylinder through the medium of outer angle plates or ends 47 constituting the enclosures of the heads and angle plates 48 secured to the ends of the cylinder, nutted draw bolts or rods 49 engaging the angle plates 47 and 48, as shown by Fig. 3, to set up a tight fitting of the heads 12 with relation to the cylinder ends. The shaft 9 in the present improvement is also secured to the bottom of the cylinder in a more effective manner than in the structure disclosed by my pending application aforesaid, and as shown by Fig. 4, the means for setting up this improved shaft securing association with the cylinder consists of I-beams or channels 50 having the upper inner portions of the flanges thereof secured to the bottom plates 29 by means of fastenings 51, and the lower inner flanges of the said beams or channels similarly secured by fastenings 52 to the shaft 9. Side cover plates 53 are applied over the outer flanges of the I-beams or channels 50 and have openings 54 therein to snugly fit over the shaft 9, filling plates 55 being introduced in the outer channels of the beams 50 as brace or reinforcing means, and the said side cover plates 53 together with the opposite I-beams and plates 55 are secured by transversely extending nutted draw rods 56. By this means the shaft 9 is firmly secured to the bottom of the cylinder 10, and as the side cover plates extend a considerable distance on opposite sides of the shaft 9, the strain on the cylinder incident to the operation of the latter and the shaft is distributed over a larger area, particularly in view of the fact that the beams 50 extend full length of the cylinder and also over the heads 12 and provide a stable foundation or base structure for the cylinder as a whole.

Various mechanisms for operating the cylinder 10 might be adopted for actuating the said cylinder regularly in an oscillating manner to effect a gravitation of the piston 11 towards opposite ends of the cylinder in alternation, but one preferred form of operating mechanism consists of an endless chain belt 57 attached to arms 58 projecting outwardly from the opposite extremities of the lower portion of the cylinder 10, or from the base frame construction for the cylinder above specified. The endless belt 57 passes downwardly over a lower idler sprocket 59 at the center of the lower portion of the pedestal 5, as shown by Fig. 1, and from the arms 58 the said chain belt extends upwardly over a sprocket wheel 60 loose on a drive shaft 61, the sprocket wheel 60 having a clutch hub 62 integral therewith or attached thereto. On the shaft 61 a band pulley 63 is keyed and engaged by a belt 64 running from a suitable source of power such as a line shaft of a machine shop or other mechanical institution. On the shaft 61 adjacent to the band pulley 63 is a bevel gear 65 in alinement with an opposing bevel gear 66 adjacent to or forming part of the sprocket wheel 60. The gear 65 is loose on the shaft 61, and between the two gears 65 and 66 is a transmission bevel gear 67 suitably supported to operate between the two gears 65 and 66. The gear 65 has a clutch hub 68 formed with or attached thereto, and between the two hops 62 and 68 a clutch sleeve 69 is splined to and slidable on the shaft 61, and whereby the motion of this shaft may be transmitted to either the gear 66 or the gear 65, the reversal of movement of the main driving sprocket wheel 60 and the gear 66 being accomplished through the interposed gear 67. The clutch sleeve 69 is shifted to alternately change the direction of movement of the chain belt 57 by a yoke 70 having a depending arm 71 with a lower fork 72 with suit-

ably bent terminals for engagement by strikers 73 projecting from the arms 58, or some other part of the cylinder structure in a manner and as fully disclosed in my pending application aforesaid, and whereby when the cylinder 11 is thrown up at one end as shown in dotted lines in Fig. 1, the clutch sleeve 69 will be shifted through the forked extremity or end of the arm 71 depending from the yoke 70, to change the direction of movement by bringing different gearing into play and to cause the cylinder and piston to be thrown over from the dotted position shown in Fig. 1 to the reverse position, or so that the end or extremity of the cylinder that is uppermost as shown in Fig. 1 will be lowermost, and this oscillation continues during the actuation of the chain belt 57 through the gearing and mechanism explained, and as a consequence, the cylinder will be regularly operated and the piston automatically shifted in alternation from one end of the cylinder to the other. As in my aforesaid application, the improved cylinder and piston will be arranged to have a double action, or so that the intake and discharge is effected in opposite extremities in an automatic and positive manner. It will be understood that the chain belt 57 will have sufficient slack to render it effective in operation of the cylinder and piston and also to accommodate it to varying positions of the latter during the rocking movement or oscillation thereof.

The discharge outlet 15 from the discharge conduit 14, or which receives as a unit the discharges from the opposite extremities of the oscillating cylinder 10 through the action of the piston 11, has a coupling 74 attached thereto and having a flexible pipe 75 associated therewith and of any suitable length and in turn connected to a coupling 76 attached to the bottom of a reservoir 77 located in any suitable position relatively to the oscillating shaft 9, this reservoir 77 being shown in Fig. 1 simply as a matter of convenience in illustration in side elevation above the shaft 9. This reservoir 77, however, may be located in other positions best adapted to serve its function and the pipe 75, or any of the connections between the discharge outlet 15 and the bottom of the reservoir, may be sufficiently flexible to compensate for the oscillation of the cylinder 10. Furthermore, the reservoir 77 is shown in upright position, but this particular position is not essential to the practical operation of the reservoir 77 as a storage means, as it might be tilted slightly at an angle particularly towards the right. The air under pressure passing through the discharge outlet 15, connections 74 and 76 and pipe 75 enters the lower portion of the reservoir or storage tank 77, or if water be forced upwardly through the same parts by action of the cylinder 10 and piston 11, the water will be likewise held in the lower part of the reservoir. From the reservoir or tank 77 the stored air under pressure will be liberated for any practical service desired. and likewise, water that may be delivered into the reservoir 77 may be similarly distributed or discharged from the said reservoir or tank 77 for operation of other mechanisms.

The operation of the improved mechanism is simple. The cylinder 10 is oscillated through the actuation of the endless chain belt 57 and assumes opposite angular positions to effect a gravitation of the piston 11, and in the case of air compression, to thereby draw in the air from the surrounding atmosphere, or from any other source alternately at opposite ends of the cylinder and compress the indrawn charges and force the latter outwardly through the discharge pipe 14 into the connections 74, 75 and 76 and finally into the reservoir or tank 77. The same operation ensues in elevating and forcing water into a similar reservoir or tank, and from the tank or reservoir the water may be supplied to any mechanism desired.

All of the parts of the improved apparatus have been constructed for strength and durability, and it is proposed to modify the proportions and dimensions of the several parts to adapt the improvements to various uses without departing from the nature or spirit of the invention.

What is claimed as new is:

1. In a mechanism of the class specified, an oscillating cylinder with a piston loosely mounted therein serving as means for preparing an operating medium for service, the cylinder being mainly formed of plastic material and having a bottom metal plate with upwardly projecting runner ribs and the bottom of the piston having a metal plate with depending grooved ribs to receive the upper reduced portions of the runner ribs, the piston being hollow and comprising side angle plates and top and bottom plates secured to the angle plates, a rock shaft for the cylinder, and means interposed between the bottom plate of the cylinder and the rock shaft for strongly securing the said parts and distributing strain incident to the rocking motion of the cylinder fully over the bottom of the latter.

2. In a mechanism of the class specified, a rocking cylinder having plastic walls, a piston mounted to loosely gravitate within the cylinder of hollow form and comprising a skeleton metal frame with a plastic covering over the sides and bottom thereof, end metal plates applied to the piston and extending above the top plate of the latter to engage the top wall of the cylinder and also depend-

ing and movable over a portion of the bottom wall of said cylinder, the said end plates operating to shape the cylinder chamber, a rock shaft, and means connecting the rock shaft to the bottom of the cylinder.

3. In mechanism of the class specified, a rocking cylinder having plastic walls and intake and discharge connections, a hollow piston mounted to freely slide in the cylinder and provided with plastic side and bottom walls, a rock shaft for operating the cylinder, and connecting means between the rock shaft and bottom of the cylinder and consisting of I-beams secured to the shaft and bottom of the cylinder, outside cover plates with openings therein to receive the shaft, reinforcing filling plates between the outside cover plates and the said beams, and draw rods extending transversely through the cover plates, filling plates and beams for distributing the strain over a greater area of the bottom of the cylinder.

In testimony whereof I have hereunto set my hand.

JAMES F. THOMAS.