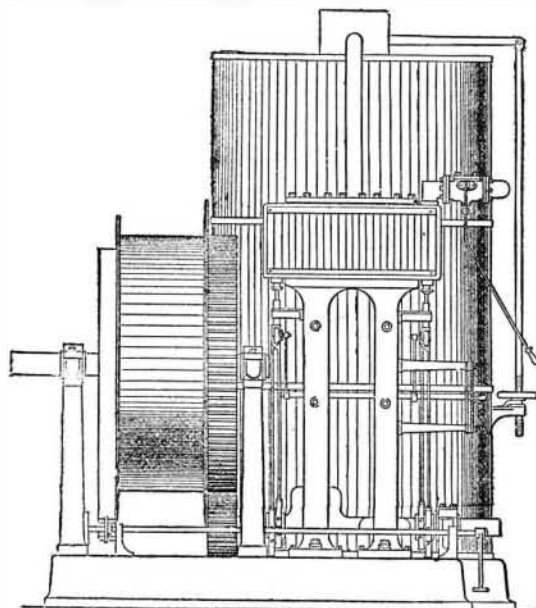


[Engineer.]

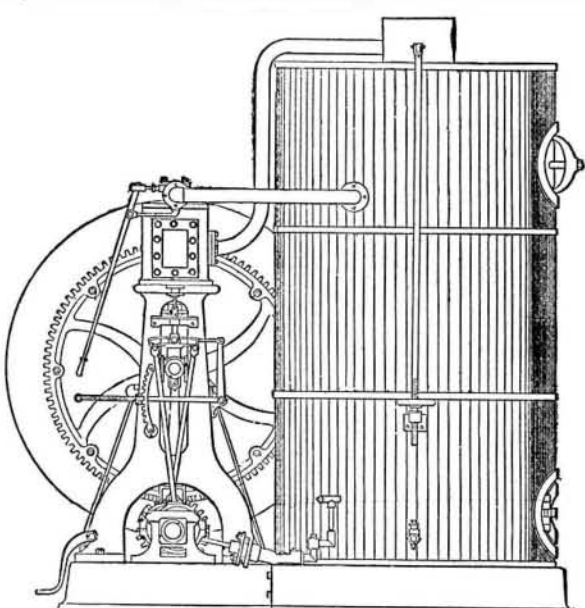
## DOUBLE-CYLINDER WINDING-ENGINE.

We illustrate above a very neat form of winding-engine, recently introduced by Messrs. Davey, Paxman & Co., of Colchester, Eng. It is a modification of the vertical engine exhibited at Taunton last year by this firm.

The starting valve-lever, reversing-lever, and brake-treadle can all be controlled by one man, without changing his position, at the same time he is able to see the pit's mouth while handling the engine. All the wearing parts are, where possible, made of steel or case-hardened. The slides are arranged to cut off at eleven sixteenths of the stroke, so as to insure the engine starting from any position in which it may stop. The eccentrics working the slides are cast together, and have large wearing surfaces. The crank-shaft is of wrought-iron, bent out of a solid bar. The pump is placed directly on the tank-base, from which it draws. The winding-drums are cast as two flange pulleys, and lagged between the flanges with 3 in. timber, and the spur segments are bolted directly on to the side, thus taking all strain off the drum-shaft. The



DOUBLE-CYLINDER WINDING-ENGINE.



brake-wheel is cast on the opposite side of the drum, and connected by a wrought-iron brake-strap to a lay shaft carried on the base, and which is worked by a treadle, a counterbalance relieving the drum when the foot is taken off. The whole engine and boiler are contained on one bed-plate, forming a water-tank, but, where desirable, the drums can be placed lower down or on independent foundations. The total weight of engine and boiler complete is 10 tons.

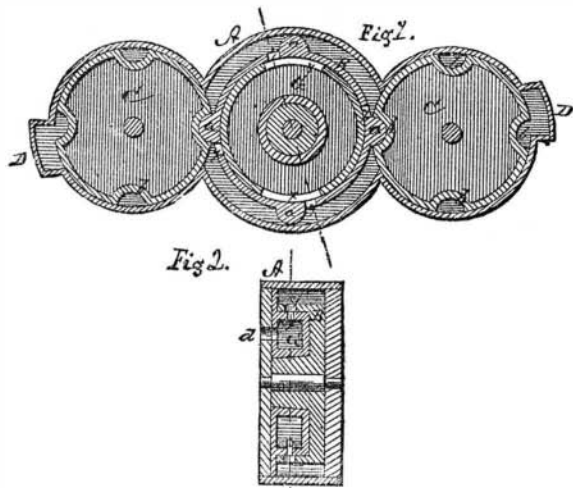
The principal dimensions are given in the following tabular statement:

Diameter of cylinders.....	10½ in.
Length of stroke.....	14 in.
Diameter of crank-shaft.....	4 in.
Diameter of drum-draft.....	5½ in.
Pitch of gearing.....	2 in.
Proportion of wheels.....	4 to 1
Diameter of drum.....	5 ft.
Width of drum.....	1 ft. 9 in.
Diameter of pump plunger.....	2½ in.
Stroke of pump plunger.....	3½ in.
Throw of eccentrics.....	3½ in.
Diameter of piston-rods.....	1½ in.
Diameter of slide spindles.....	¾ in.
Connecting-rod centres.....	2 ft. 8 in.
Diameter of brake-shaft.....	1½ in.
Diameter of brake-wheel.....	5 in.
Width of brake-wheel.....	4½ in.
Diameter of Paxman boiler.....	5 ft. 2 in.
Height of boiler.....	10 ft.
Total heating surface.....	320 sq. ft.
Diameter of steam-pipe.....	2½ in.
Diameter of exhaust.....	3 in.
Area of fire-grate.....	14 sq. ft.
Depth of base.....	12 in.
Thickness of boiler-plates.....	7/8 in.
Diameter of tubes.....	3½ in.
Diameter of uptake.....	16 in.
Diameter of feed-pipe.....	1½ in.

## ROTARY ENGINE.

By J. C. TRUSS, Marion, O.

A, the casing, receives the centre wheel B and two side wheels C C. The centre wheel B has four lugs *a a* on its



## ROTARY ENGINE.

periphery, at equal distances apart, to fit in corresponding recesses *b b* on the wheels C C as the wheels revolve.

The casing A is at each end formed with a pocket D, which becomes filled with steam, carried into it by the recesses *b* in the wheels C C. The steam in the pockets D D serves

to balance the wheels C C by exerting a counter-pressure at a point opposite the point where the steam strikes the face of the wheel.

The centre wheel B is formed with an annular recess on one side, which fits snugly over an annular steam-chest G secured to the head of the casing. This steam-chest is, in its periphery, provided with two elongated ports *x x* opposite each other, and in the wheel B, behind each lug *a*, is a steam-port *y*, for the admission of steam. The steam enters the steam-chest through an aperture *y* in Fig. 2.

The length of time the steam acts direct is regulated by the length of the port *x*.

When the ports have passed so that there is no communication between the steam-chest and cylinder, the steam works on expansion until the next port, *y*, comes around to the port *x*.

## IMPROVEMENT IN PUMPING-ENGINE.

By W. WALKER, Manchester, Eng.

C is the piston, which is formed with two heads, *a a*, con-

of this movement of the valve would be to open the port *y* for the admission of high-pressure steam into the annular space *g*, and to establish a thoroughfare for the flow of expanding steam from the annular space *h* through the passages *x, f*, and *n* into the space *j*, the passage *m* being caused to communicate with the exhaust-passage *c*, whereby the reversal of the direction of motion of the piston would

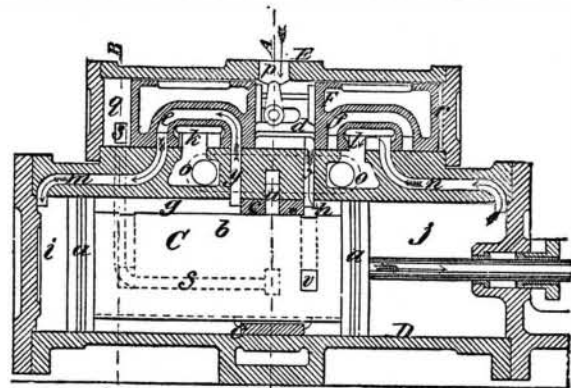


FIG. 2

## NEW PUMPING-ENGINE.

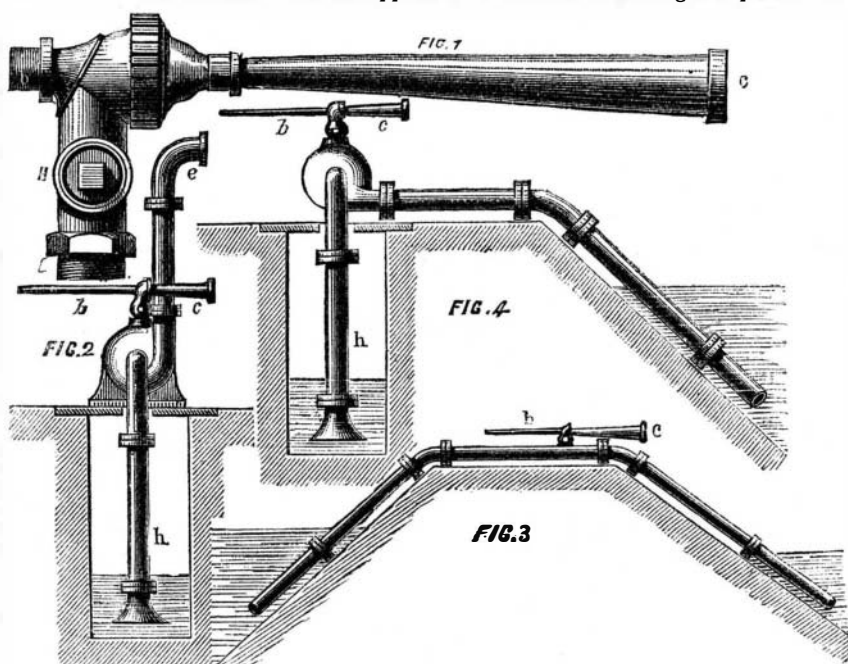
be effected. A starting-handle, *z*, is provided in order that the valve may be worked by hand when the pump is to be set in motion after being at rest. The said handle is mounted on a rocking-shaft, on which is fixed or formed a lever, which gives motion to the valve when the shaft is rocked by means of the said handle.

## NEW STEAM-EJECTOR.

THE steam-ejector of Nagel & Kaemp is mainly designed for centrifugal pumps, water-raising pipe systems, and other purposes, dispensing in centrifugal pumps with the use of the bottom valves.

One of the objections of centrifugal pumps lies in the difficulty of first filling the same, which produces frequently interruptions in their working. It is true that this difficulty does not occur when the pump and casing are submerged, but the application of the pump in this manner is not of frequent occurrence. A bottom valve is generally employed to enable the filling of the pump, but this valve is objectionable, as it retards the passage of the water and does not close tightly in impure water. Further, it is obvious that with the size of the pumps, the size of the suction-pipes and valves, and consequently the difficulty of keeping the latter tight, increases. The interruptions in the working of the pump caused thereby are the more annoying as the valve has to be below the water-level, and is thereby more or less inaccessible.

The ejector, Fig. 1, is designed to overcome the defects mentioned, and consists simply of a pipe, that exerts a suction by means of steam passing through the same. The application of the ejector to centrifugal pumps is shown in Fig. 2, where the apparatus is screwed to the highest point of the



## NEW STEAM-EJECTOR.

pump-casing. One end of the ejector is connected by a pipe with the boiler. To fill the pump, the opening of the conducting pipe is closed, and the stop-cock H (Fig. 1) opened. Steam is then admitted to pass through the horizontal ejecting-pipe *c*, so that the air is first drawn out from pipe *h* and the pump-casing, producing a vacuum, which causes the rising of the water until it is high enough to condense the steam, entering at *b* and be forced out at *c*. This indicates that the pump is filled, so that the same may be run instantly at normal speed, after opening the conducting-pipe and closing the cock H. The steam-pipe may then be shut off near the boiler to prevent waste of steam by condensation.

In Fig. 3 the application of the ejector is shown to pipes for raising and conducting water, the device serving in this case to liberate the air collecting at the highest point of the