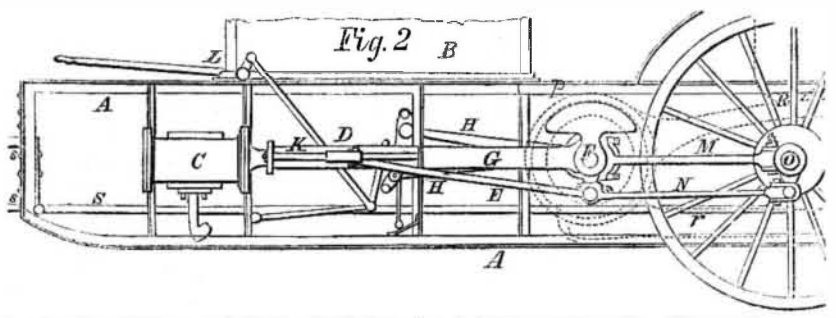
Grate area, 804 square inches; flue area, 214½ square inches. Total fire surface, 460 square feet. The boiler has been tested under a steam pressure of 200 pounds, and is safe under a much higher pressure; ordinary working pressure, 130 pounds.

The general arrangement of the machinery is that of a locomotive, with outside connections. The cylinders are of 7½ inches diameter and 14 inches stroke. The valves are operated by a stationary link and reversing lever, by means of which the steam may be cut off at any point in the stroke, giving the benefit of expansion in any desired degree, or may be instantaneously reversed.

The connecting rods from the engines act on cranks, placed, not as in locomotives upon the shaft of the driving-wheels, but upon an

Fig. 2

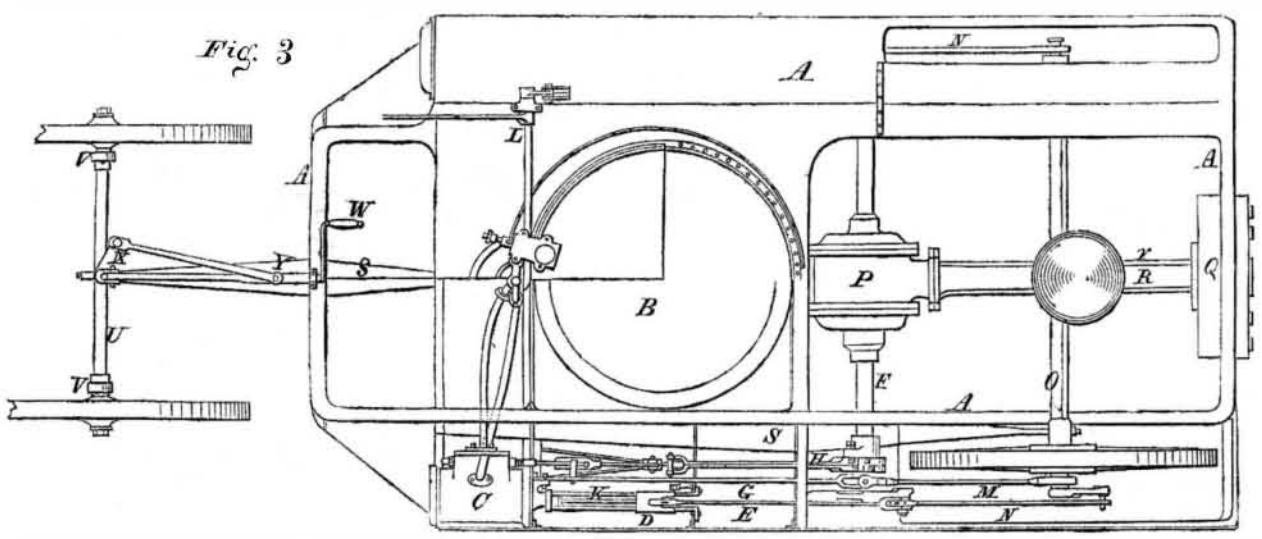


intermediate shaft, revolving in fixed bearings upon the frame, and operating the pump, which is one of Cary's Patent Rotary Force Pumps of the largest size. From this, the power is transmitted by a parallel rod to the driving wheels behind; the axle of which is kept at a uniform distance from the intermediate shaft by two strong arms, called radius rods, which take hold of each shaft near its ends. The moving parts of the engine are consequently undisturbed by the motion of the wheels, however rough the road may be, the power being accurately transmitted to them, whatever position they may take above or below the center line of the cylinders; while ball and socket joints, at the ends of the parallel and radius rods provide against any degree of side movement, twist, or flexure. When the engine reaches the fire, the parallel rods can be disconnected almost instantly, and the power then acts upon the pump alone.

In this important part of their apparatus, Messrs. Lee & Larned, it will be seen, have adopted substantially, with such modifications and additions as their special purpose required, the well-known steam carriage arrangement of Mr. J. K. Fisher, of which the intermediate shaft, radius, and parallel rods briefly described above are the principal elements. The screw steering apparatus is also a part of Mr. Fisher's arrangement. The use of the intermediate shaft to drive the rotary pump, with the instantaneous disconnection of the parallel rods, is a mechanical combination of very great merit.

The frame or bed, of boiler and angle iron, is hung upon four strong springs running lengthwise, and one cross spring under the hinder axle, not seen in the figures. The two front springs are placed one above the other in the line of the center of the carriage, taking hold of boxes upon the vertical steering spindle, T, by turning which, by means of the horizontal crank, X, operated by the screw sleeve, Y, and the winch, W, the direction of the axle is controlled, and the carriage steered with great facility and precision. In these

Fig. 3



connections, as on those with the hinder axle, ball joints are provided to secure flexibility.

The total weight is about five and a half tuns. The length of the frame or body is is about 14½ feet, its breadth 7 feet, and the total length of carriage 20½ feet. Fuel enough for two hours consumption can be carried in the space back of the hinder axle. Steam can be raised to working pressure in from six to ten minutes; but it is intended that steam shall be kept up at all times, so that the engine can start at a moment's warning. As the boiler is very thoroughly clothed, and the loss of heat by radiation very small, this can be done at a moderate expense compared with that of supporting a horse-establishment for hauling the engine.

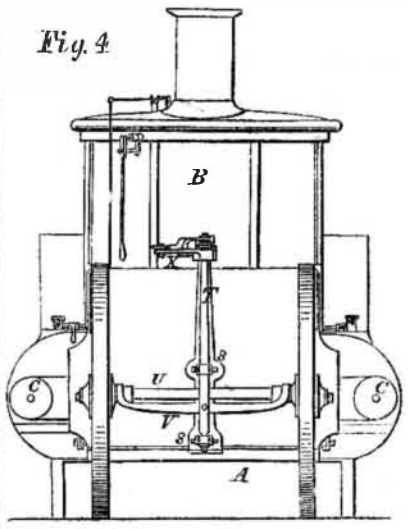
The pump discharges 4 6 gallons per revolution, and may be run with good effect at any speed, from 50 revolutions to 250.

At the trial on the 5th instant, before Street Commissioner Cooper and other officials, it threw from 700 to 750 gallons per minute through a 1⅝ inch nozzle, a horizontal distance of 252 feet, and a perpendicular hight estimated at not less than 160 feet; also two 1⅛ inch streams about the same hight and distance. The hose was then taken to the top of a five-story building, 60 feet high, and a 1⅝ inch stream thrown 150 feet horizontally, and an estimated additional hight of 80 feet. From the same position, playing through an open butt of 2½ inches diameter, water was thrown at the rate of about 900 gallons per minute, over two intervening roofs, with great force and effect, upon the roof of the third building beyond, a distance of 60 feet.

After the trial, it ran, with fifteen men on board, over some of the steepest grades and worst conditioned streets in the city, to the entire satisfaction of the Street Commissioner, who rode on the engine and selected the route.

At the trial in the Park, on the 18th inst., it threw a 1⅝ inch stream 267 feet, a two inch stream 232 feet, and a two and a half inch stream through an open butt the astonishing distance of 196 feet; the

Fig. 4



pump making 240 revolutions and discharging 1,100 gallons of water per minute, and the boiler supplying abundance of steam at this speed, with a pressure of 150 pounds to the inch. This performance is believed to be unprecedented in the history of hydraulic machinery of a portable kind, whether for steam fire-engine purposes or any other.

Further information may be obtained from Messrs. Lee & Larned, 52 John street, New York, room No. 7.

Fagan's Improved Pump.

An interesting book might be written on pumps, if the line of thought pursued were the ingenuity of man as displayed in his endeavors to raise water by these means. There is no difficulty in the aqueous world with which inventors have not coped, and in the majority of instance have proved successful, and a specimen of such success forms the subject of our illustration, which is a novel pump invented by J. L. Fagan, of Anaqua, Texas, and on which he has applied for a patent.

Fig. 1 is a view of the pump, the lower part being shown in section. A is a hollow cylinder attached to a tubular shaft, B. The cylinder, A, is secured in a circular step, C, attached to a bed-piece, D, placed in the well. The shaft, B, has its bearing in a crosspiece, *a*, and the upper end of the shaft fits in a hollow stationary cap, E, having a nozzle, F. The cylinder, A, communicates with B by two curved pipes, *c d*, each provided with a valve, *e*, opening into B. Within A a flanch or piston, G, is secured, (this is better seen in Fig. 2, which is an horizontal section through A,) and extends inwards toward the vertical shaft, H, that is secured to the bed-piece, D, and is fitted loosely in the top of the cylinder. To the shaft, H, a radial plate, I, is fixed and which extends to the inner surface of A. The plate, I, and piston, G, divide the cylinder into compartments, *f* and *g*, and each compartment has an aperture, *h*, provided with a valve, *i*, operating inwards. The tubes, *c d*, communicate each with a separate compartment, *f g*. On the upper part of the shaft, B, are placed two bevel wheels, *h′ h′*, into which a corresponding wheel, *i′*, on a horizontal shaft, J, gears. To the shaft, B, two pawls, K K, are attached, which are made to catch alternately into their respective wheels, *h′* and are alternately released from them by means of springs, *j j*, and inclined plates, *k k*. The springs, *j*, being attached to shaft, B, and the inclined planes to the framing that supports the working parts; horizontal pins, *l*, are also attached to the framing. The pawls, K, bear against the smooth surfaces of the bevel wheels, *h′*, notches, *m*, being made in them into which the pawls catch at the proper time.

Fig. 1

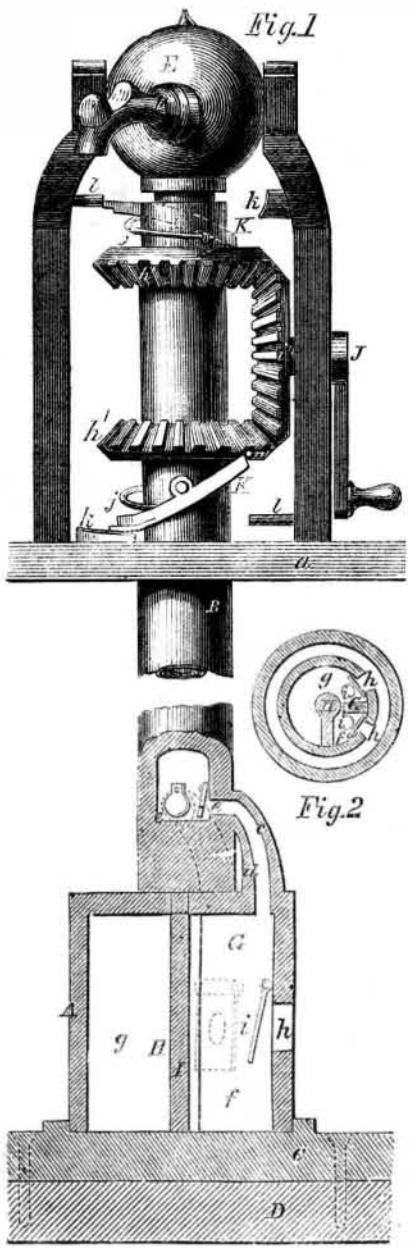


Fig. 2

The operation is as follows:—Power is applied to the shaft, J, in any proper manner, and a reciprocating partially rotating movement is given the cylinder, A, through the medium of the gearing, *h′ i′*, and ratchets, K K, the ratchets being made to catch alternately into the notches, *m*, of their respective wheels, by means of the springs, *j*, and elevated therefrom by the inclined plates, *k k*, the pins, *l*, preventing the pawls from dropping into the notches during the return movement of the wheels, *h′*, when the notches pass under the pawls. The piston, G, forces the water alternately from the chambers, *f g*, through their respective tubes, *c d*, into the shaft, B, from whence it is discharged through the nozzle, F. The valves, *h*, close by the pressure of the water under the action of the piston, G. In this pump there are but few parts, and they simply arranged; it is not liable to get out of order, and is a very efficient submerged pump.

Any further information will be given by the inventor upon being addressed as above.

Death of Madame Ida Pfeiffer.—This lady died in Vienna on the 27th of October, of an illness contracted during her late visit to Madagascar. Her travels and adventures have been made familiar to the reading public by many interesting volumes.