(No Model.)

W. MOORE.

APPARATUS FOR SEPARATING LIQUIDS FROM NATURAL GAS.

No. 399,427. Patented Mar. 12, 1889.

Fig. 1.

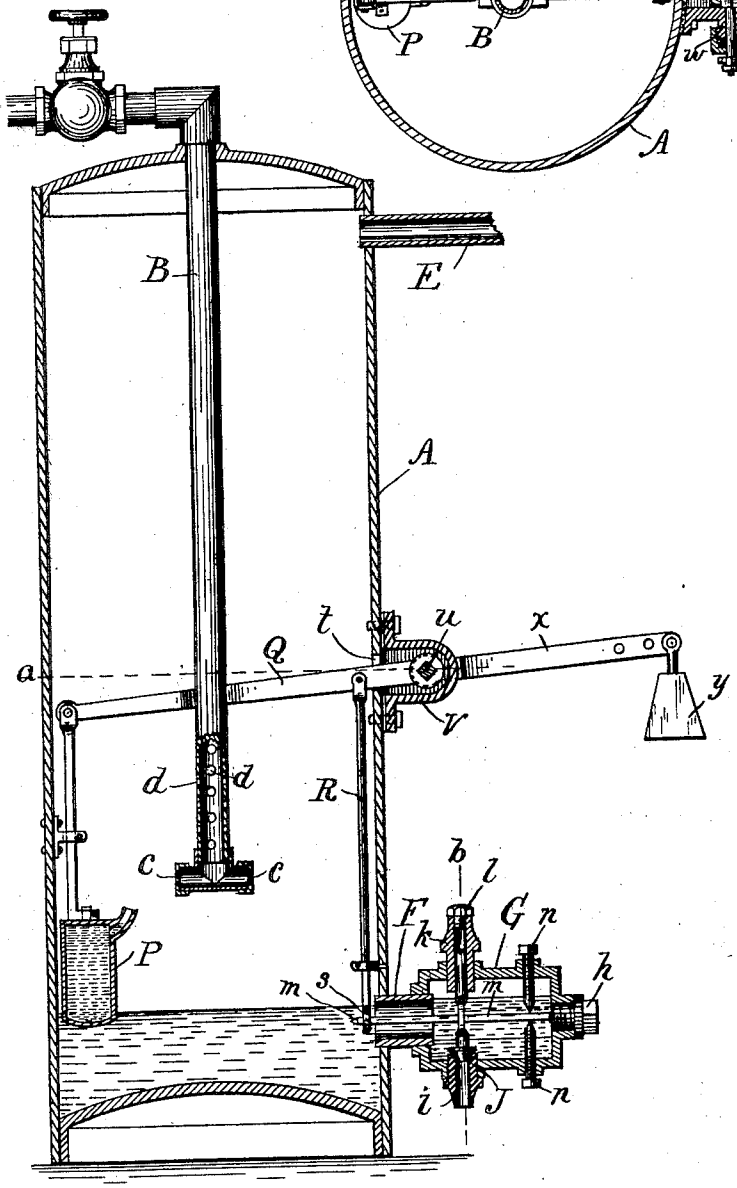


Fig. 2.

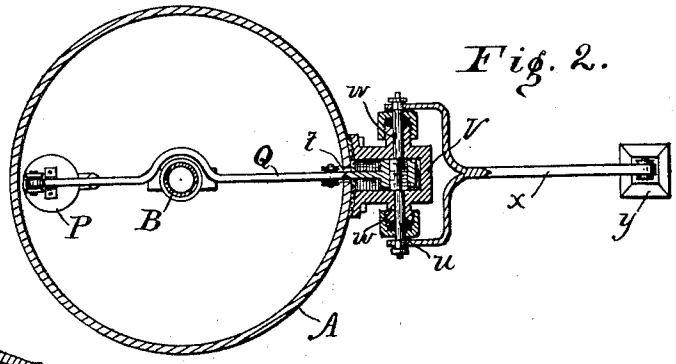
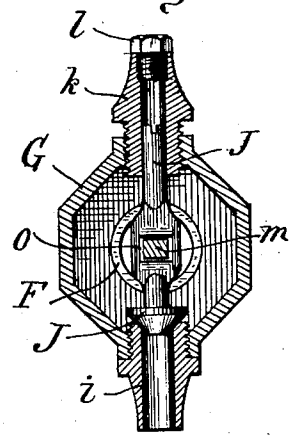


Fig. 3.



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APPARATUS FOR SEPARATING LIQUIDS FROM NATURAL GAS.

SPECIFICATION forming part of Letters Patent No. 399,427, dated March 12, 1889.

Application filed May 21, 1888. Serial No. 274,498. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM MOORE, a citizen of the United States, residing at Kokomo, in the county of Howard and State of Indiana, have invented a new and useful Improvement in Apparatus for Separating Liquids from Natural Gas, of which the following is a specification.

My invention relates to an improved apparatus for separating from natural gas the liquids and other impurities which are usually found in mechanical combination therewith.

The object of my improvement is to provide, in an apparatus of the class described, means whereby the fulcrum of the lever which controls the trap-valve may be readily adjusted to the new position of the valve when refitted.

The accompanying drawings illustrate my invention.

Figure 1 represents a central vertical section of the entire apparatus. Fig. 2 represents a horizontal section at *a*, Fig. 1. Fig. 3 represents a transverse vertical section, on an enlarged scale, at *b*, Fig. 1.

A is a cylindrical wrought-steel reservoir.

B is the inlet-pipe leading from the gas-well. Pipe B extends downward inside the reservoir about two-thirds of its depth, and its lower end is partly closed by a T-coupling having reduced openings *c c*. For the purpose of permitting the gas to separate easily from the water or other liquids carried by it, that portion of the pipe B immediately above the lower end is perforated, as at *d d*. The combined gas and liquid being under a high pressure and moving in the pipe with great velocity, the greater momentum of the liquid carries it to the lower end of the pipe before it escapes, while the gas escapes in a dry state from the openings *d*.

E is a pipe through which the gas passes out of the reservoir.

F is the pipe through which the liquids are discharged from the reservoir.

The discharge of the water from the reservoir is controlled by means of a trap-valve, which is constructed as follows:

G is a tubular casing having one end adapted to receive the discharge-pipe F, and the other end is closed by a plug, *h*. The lower side of casing G is provided with a discharge-opening, *i*, which is closed by a valve, J. In the upper side of casing G, opposite the discharge-opening *i*, is a vertical bearing, *k*, in which the cylindrical upper part of valve J may rotate and also slide longitudinally, the purpose being to form a guide for the longitudinal movement of the valve in opening and closing, and also a guide for guiding the valve to its seat, the upper end of the valve-stem being slotted to receive a screw-driver or other tool for rotating it. The upper end of bearing *k* is closed by a screw-plug, *l*. Valve J is opened and closed by means of a lever, *m*, consisting of a simple straight bar of iron which passes through a mortise, *o*, Fig. 3, in the valve-stem and projects through pipe F into the interior of the reservoir. The fulcrum for lever *m* is formed by two opposed set-screws, *n n*, arranged in the upper and lower sides of the casing, near its outer end, the lever resting between them. Lever *m* is automatically raised by the accumulation of liquid in the reservoir by means of the float P, lever Q, and connecting-rod R, said rod having at its lower end an eye, *s*, into which the free end of lever *m* projects. By this construction the lever *m* may be withdrawn at any time through the opening closed by the plug *h* without disturbing the connecting-rod or the valve, thus leaving the valve free to be reground or refitted to its seat. When the valve has thus been refitted, its relation to the connecting-rod and lever has been so changed that the movement of the float and connecting-rod which would before open the valve at the proper time will now open the valve too soon. This difficulty is corrected by re-adjusting the fulcrum of the lever, the lower set-screw, *n*, being turned outward and the upper one inward until the valve opens as at first.

Float P is of that class which consists of a hollow sheet-metal cylinder filled with liquid and having an opening at one end through which the gas or vapor in which it is suspended may have access to the interior of the float. It is necessary to use with this class of floats a counterpoise-weight, and heretofore

the fulcrum of the lever to which the float is attached and the counterpoise have been arranged inside the reservoir. Such an arrangement necessitates a large diameter for the reservoir, which is an element of weakness which it is desirable to avoid in dealing with such high pressures as are found in natural-gas wells. It is also desirable to test from the exterior of the reservoir the working of the float under pressure. For these purposes I extend the lever Q out through a narrow slot, *t*, in the side of the reservoir, and secure in the outer end of said lever a short shaft, *u*. I mount shaft *u* in stuffing-boxes *w w* in each side of a small closed chamber, V, which is bolted to the side of the reservoir, so as to cover slot *t*. To the outer ends of shaft *u*, I secure the forked end of a lever, *x*, to which the counterpoise *y* is attached. By this arrangement I secure the necessary length of levers without enlarging the diameter of the reservoir, and am enabled to test the working of the float and valve by hand at any time without opening the reservoir.

In operation, when sufficient water has accumulated in the reservoir, float P is raised, and this, operating through lever Q and connecting-rod R, raises lever *m* and the valve J. Owing to the pressure on valve J when closed and the small diameter of the float in proportion to its length, the float is not raised until it is nearly submerged. As soon as the valve begins to open the pressure on it is nearly balanced, and the float then rises suddenly and holds the valve wide open, thus preventing the cutting of the valve-seat by any sediment which may be carried in the water. If the valve should leak, the operator, after removing plug *h* in the outer end of casing G, and loosening one of the set-screws *n*, may withdraw lever *m*; then, having removed plug *l* in bearing *k*, may, by means of a screw-driver or like tool, rotate the valve and regrind it to its seat; or, if necessary, the entire casing, with its contents, may be removed without disturbing the interior arrangements of the reservoir.

I claim as my invention—

In an apparatus for separating liquids from natural gas, the combination, with the reservoir, the tubular casing detachably secured thereto so as to connect with the interior thereof, and having a discharge-opening, the valve arranged to close said opening, and the lever arranged to operate said valve, of a vertically adjustable fulcrum consisting of a pair of set-screws mounted in opposite sides of the tubular casing and arranged to embrace the lever between them.

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