J. B. EDWARDS.

OIL CRACKING APPARATUS.

APPLICATION FILED FEB. 17, 1920.

1,410,175. Patented Mar. 21, 1922.

3 SHEETS—SHEET 1.

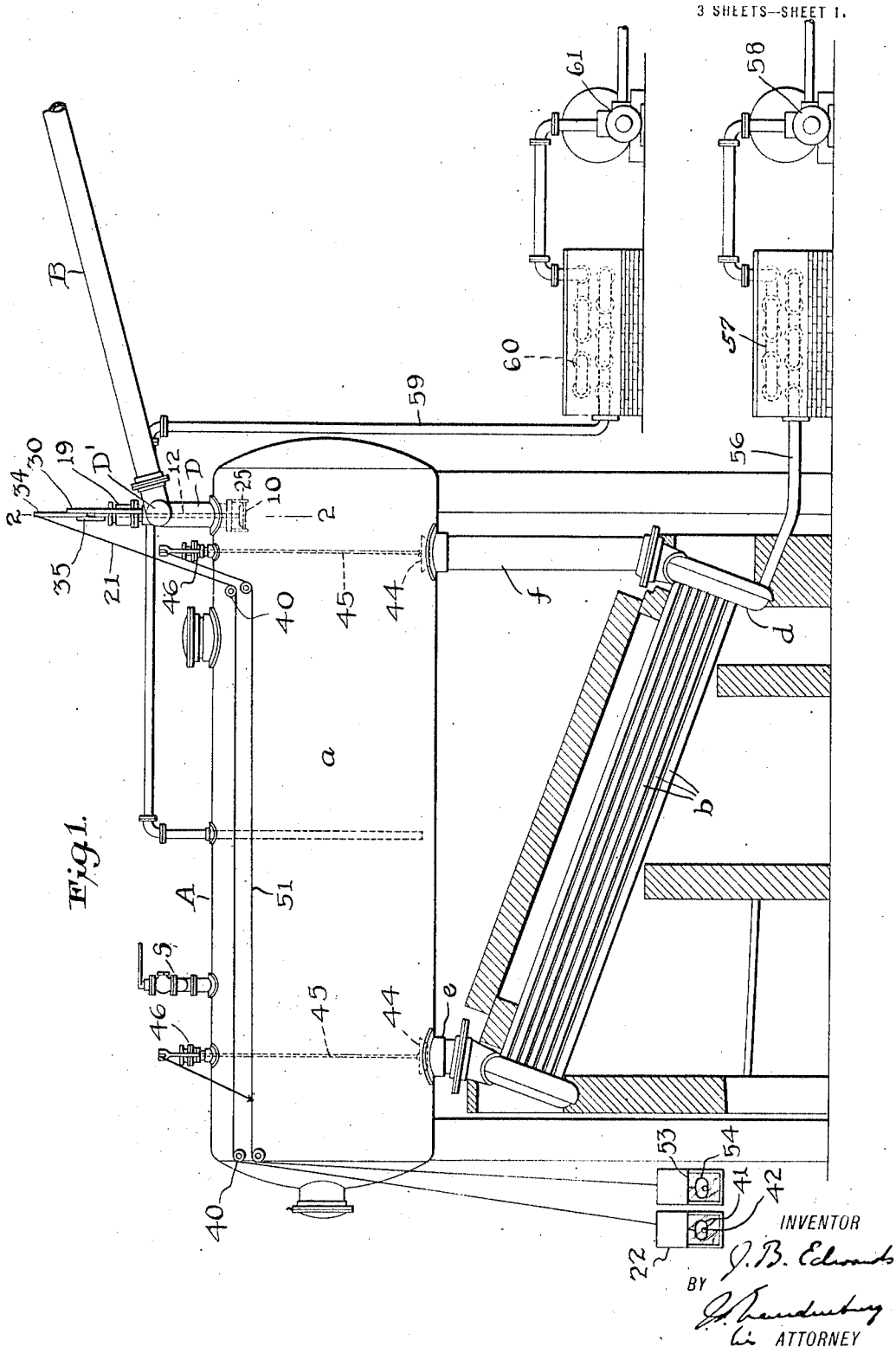

Fig. 1.

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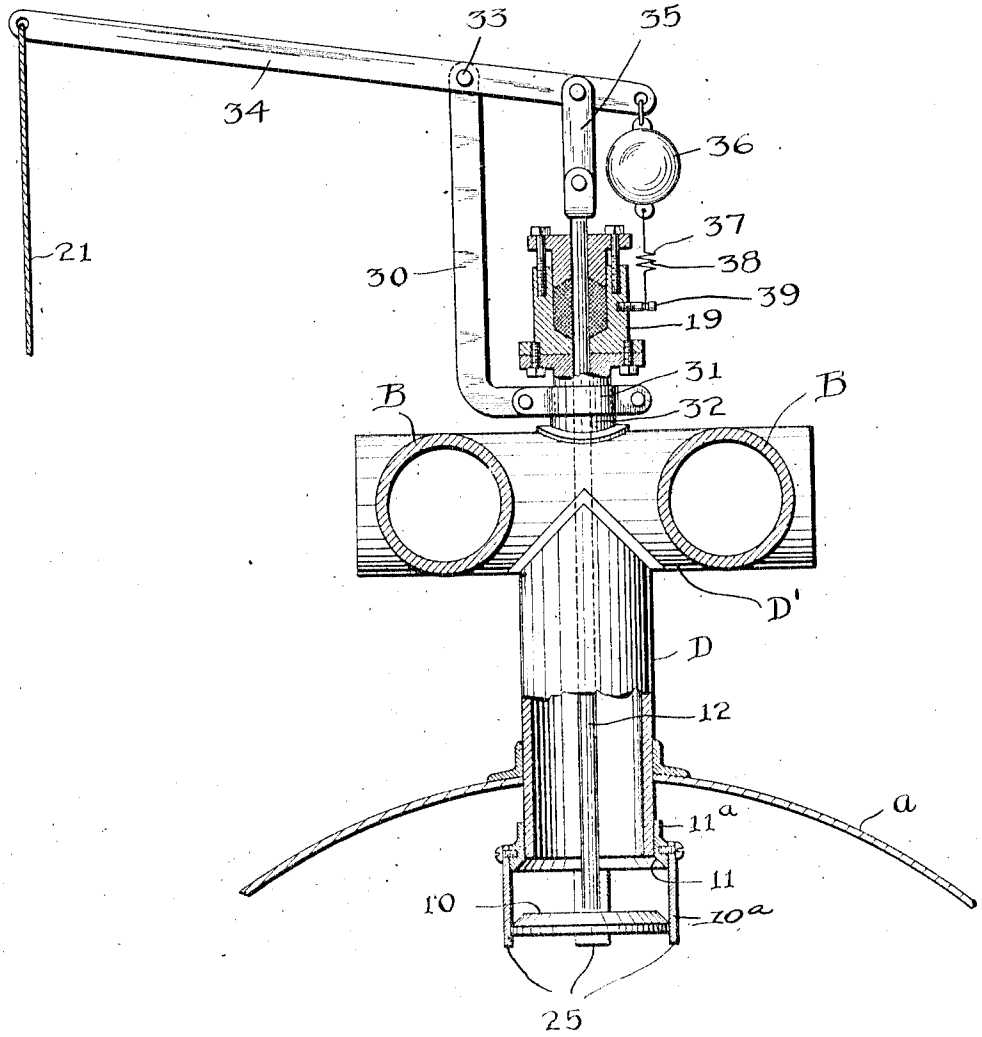
3 SHEETS—SHEET 2.

Fig. 2.



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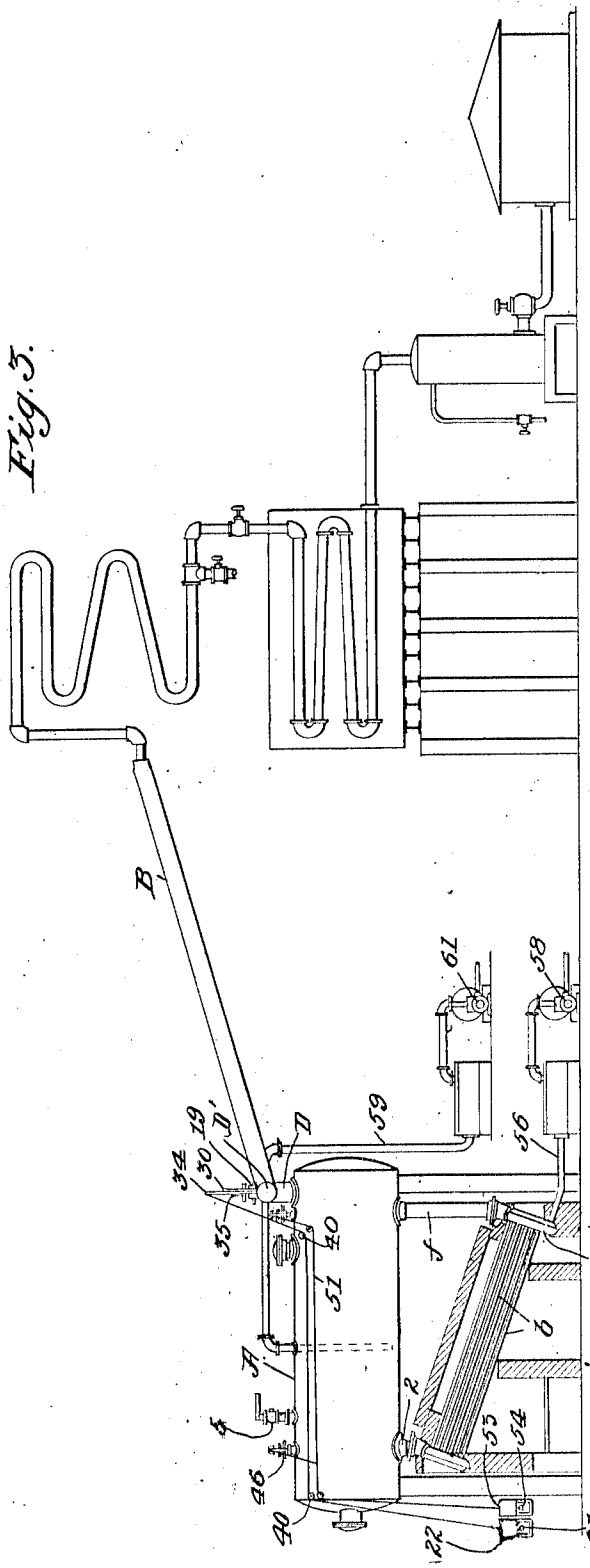
3 SHEETS—SHEET 3.

Fig. 3.



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UNITED STATES PATENT OFFICE.

JOSEPH B. EDWARDS, OF JERSEY CITY, NEW JERSEY, ASSIGNOR TO TIDE WATER OIL COMPANY, OF BAYONNE, NEW JERSEY, A CORPORATION OF NEW JERSEY.

OIL-CRACKING APPARATUS.

1,410,175. Specification of Letters Patent. Patented Mar. 21, 1922.

Original application filed August 8, 1918, Serial No. 248,846. Divided and this application filed February 17, 1920. Serial No. 359,378.

To all whom it may concern:

Be it known that I, JOSEPH B. EDWARDS, a citizen of the United States, and resident of Jersey City, in the county of Hudson and State of New Jersey, have invented a new and useful Oil-Cracking Apparatus, of which the following is a specification.

In my Patent No. 1,277,884, dated September 8, 1918, I have disclosed safety means for petroleum cracking apparatus of the kind wherein a still containing a bulk of oil, and an extensive vapor eduction and condensing system leading therefrom, are both maintained under a substantial back-pressure of the vapors, and wherein, consequently, a break such as not infrequently occurs at one point or another in the eduction system will ordinarily cause the heated contents of the still to be expelled into the atmosphere, where they ignite. A fire started in this way is uncontrollable, because of the large amount of oil involved and the pressure which drives it forth, and is the more serious because a number of the stills are usually built in a row or battery, the whole of which is likely to be destroyed, as has occurred. The present invention embodies the matters claimed in my said patent and provides certain improvements in the vapor shut-off means which will become apparent from the specification.

In the accompanying drawings forming a part hereof:

Fig. 1 is an elevation of a still and adjacent parts;

Fig. 2 is an enlarged vertical cross-section on the line 2—2 of Fig. 1.

Fig. 3 is a semi-diagrammatic view, partly in section, showing conventionally, the means for maintaining pressure in the eduction system.

In Fig. 1, A represents a petroleum still of the tubular type having a vapor outlet at the top and toward the rear of its shell *a*; with which is connected the vapor eduction and condensing system, as illustrated in my said prior patent and here represented by the upwardly inclined vapor pipe B, said pipe having a vertical neck D secured in the outlet. The inclined vapor pipe, as is well known, is for the purpose of condensing and returning to the still all products heavier than the desired distillate, and is constructed of the proper length and with the proper condensing surface for this purpose. At a distant point in the system, beyond the condenser, is a valve or valves, not shown, whereby the desired pressure is maintained in the still and system. In the vapor part of the eduction system the expansion strains are severe, and even with swing joints there is always the possibility of some part from the neck D onward giving way, in which event there is forcible escape of highly inflammable vapors and oil above the flash point, with the likelihood of disastrous consequences, as above indicated.

To overcome this condition I provide, as in my said prior patent, a safety shut-off within the still at the source of the vapor eduction system, so that the whole eduction and condensing system can be promptly cut off from the contents of the still in event of rupture at any point in the system. The improved form of this shut-off will now be described. As in my prior patent aforesaid, the vapor neck D extends downwardly into the vapor space of the shell for a distance below the top, and is provided at its lower end with a beveled annular valve seat 11, which is preferably formed on a ring 11^a which is suitably secured to the exterior of the lower end of the neck. Guides 25 project downward from this ring around a valve disk 10, the periphery of which is upwardly beveled at 10^a to co-operate with the seat 11. A valve rod 12 is secured to the disk 10 and extends upward therefrom in the neck D. In the present instance the said rod preferably passes completely through the said neck and through a cross-header D′ at the top thereof, to which the dephlegmator pipes B are connected, the rod extending through an opening in the top wall of this cross-header and through a stuffing-box 19 mounted thereon. A fulcrum bracket 30 is clamped at 31 about a thimble 32 at the base of the stuffing-box, and its upwardly-projecting arm affords pivotal support at 33 to a two-armed lever 34 disposed over the vapor neck and cross-header. The short arm of this lever is connected by a pivotal link 35 with the upper end of the valve rod 12. Upon the same arm is hung a weight 36 of sufficient magnitude to bias the valve 10 to the normally open position illustrated in Fig. 2.

A spring device 37, preferably in the nature of a comparatively light or weak wire containing a certain amount of resilience or elasticity, as indicated at 38, also opposes

some resistance to the closing movement of the valve. In the illustrated construction this device is a destructible tying connection interposed between the weight 36 and an anchoring pin 39 on the stuffing-box, serving, thus to restrain the valve and valve mechanism from chattering or vibrating in the normal operation of the still. It also contributes toward preventing undesired closing of the valve through fluctuations in the pressure or flow, and in some instances it may be the sole instrumentality for holding the valve normally open.

In order to overcome the resistance of the biasing weight and of the destructible tying means and to start the valve on its closing movement in event of a rupture beyond the still, I now prefer to employ operating means extending to a suitable point, whereby effort exerted by an attendant will be transmitted to and act positively upon the valve mechanism to actuate the same in the closing direction. For this purpose I attach a cable 21 to the long arm of the lever 34 at the opposite side of the fulcrum from the valve rod and biasing weight, the said cable passing by way of suitable direction-changing guides 40 to a glazed box 22 located at a convenient position, and containing a handle 41 which may normally be caught on a pin 42. Naturally a greater or less extent of the cable, as well as the operating handle, may be protected by suitable enclosure.

It will, therefore, be understood that the vapor shut-off valve 10 is normally open and will remain so in spite of the occurrence of a substantial difference in pressure between the interior of the still and the eduction system sufficient to create an outrush of vapor through the neck. This is because of the substantial distance of the valve from its seat in the open position and of the biasing effect of the weight 36 and the weight of the valve and valve rod itself, with or without the restraint of the tying means 37. Closing of the valve in case of necessity, that is to say when a break develops in the eduction and condensing system, is caused by the attendant pulling upon the handle 41 of the cable 21, which breaks the wire 37 and raises the weight 36 and the valve 10 sufficiently to enable the pressure and velocity conditions to exercise control, whereupon the valve is immediately driven to its seat and held there by virtue of the difference in pressures until such time as the excess of pressure within the still has been largely removed by the pumping-out means, presently to be described. When the pressure in the still has been reduced to a safe value, the weight of the parts automatically reopens the valve, thereby avoiding the necessity of this being done through action of the attendant and avoiding the possibility of the valve remaining closed through oversight after the difficulty in the eduction system has been corrected and the still again placed in commission.

When the vapor valve 10 is closed the mounting still pressure may blow off to a safety valve S, wherein the outflow is so controlled as to avoid the danger of fire.

The foregoing vapor valve mechanism may be used either with a simple shell still, such as shown in my prior patent, or in a tubular still wherein a bulk supply of oil is contained in a shell connected with a nest of cracking and vaporizing tubes exposed to the fire. Other aspects of the present invention relate to a safety system for this particular type of still. As illustrated in the drawings, the shell *a* is supported in a suitable elevated position, where it is exposed to the outside atmosphere and cut off from the direct heat of the fire. The inclined cracking and vaporizing tubes *b* extend between front and rear headers *c* and *d*, which are connected with bottom openings in the shell by front and rear downcomers *e* and *f*. In a still of this character the oil circulates downward through the rear downcomer *f* to the rear header *d*, upward and forward through the multiplicity of tubes *b*, where the vapors are generated which become cracked or thermolized under the conditions existing in the still, the vapors passing upward through the forward downcomer *e* into the shell, where they become disengaged from the liquid and occupy the upper part of the shell interior.

The openings in the bottom of the shell to the front and rear downcomers *e* and *f* are guarded by suspended self-seating plug valves 44 hung on rods 45 passing through stuffing-boxes 46 in the top of the still and adapted to be instantly released by a common branched control cable 51 passing to a glazed control box 53, as set forth more particularly and claimed in my application Serial No. 248,846, filed August 8, 1918, of which this is a division.

Pumping-out means are provided comprising two branches connected, respectively, with the shell and with the tubular part of the still, that is to say the parts of the still which may be cut off from each other by the closing of the valves 44. One pumping-out line 56 passes from the bottom of the rear header *d* to a cooler coil 57, and thence to an emptying pump 58. The other pumping-out line 59 has its inlet end within the shell, near the bottom, whence it extends upward through the top of the still and eventually to a cooler coil 60, and thence to an emptying pump 61.

In case the vapor eduction and condensing system becomes open to the atmosphere at any point, the attendant breaks the glass of the box 22 and pulls the handle of the

cable 21. This, as heretofore explained, causes the closing of the emergency vapor shut-off valve 10, which then remains closed by virtue of the pressure in the still. This prevents discharge of the still contents through the eduction system to the air. The pump 58 is also set in operation and, the plug valves 44 remaining open, the entire still is emptied of liquid. In case of a break in the tubular part of the still the attendant releases the handle 54 of the cable 51, whereupon the valves 44 at the openings to the downcomers seat themselves, thus holding back the contents of the shell, which are removed to a point of safety by means of the pumping-out line 59 of the pump 61.

What I claim as new is:

1. In apparatus for pressure cracking of petroleum or its higher boiling point fractions, including a pressure oil still comprising a shell having a vapor outlet at the top, a vapor eduction system connected with said outlet, and means for maintaining a substantial pressure in the eduction system and still; a valve in the upper part of the shell movable upward to a seat at the entrance to the eduction system and adapted to be held thereto by the pressure in the shell after rupture in the eduction system, means biasing said valve to the open position, and attendant-operated means for overcoming said biasing means and starting the valve on its closing movement.

2. In apparatus for pressure cracking of petroleum or its higher boiling point fractions, including a pressure oil still comprising a shell having a vapor outlet at the top, a vapor eduction system connected with said outlet, and means for maintaining a substantial pressure in the eduction system and still; a valve in the upper part of the shell movable upward to a seat at the entrance to the eduction system and adapted to be held thereto by the pressure in the shell after rupture in the eduction system, means biasing the valve to the open position, means tying the valve in this position, and attendant-operated means connected with the valve for breaking the tying means and starting the valve on its closing movement.

3. In apparatus for pressure cracking of petroleum or its higher boiling point fractions, including a pressure oil still comprising a shell having a vapor outlet at the top, a vapor eduction system connected with said outlet, and means for maintaining a substantial pressure in the eduction system and still; a valve in the upper part of the shell movable upward to a seat at the entrance to the eduction system and adapted to be held thereto by the pressure in the shell after rupture in the eduction system, mechanism connected with the valve and including a weight biasing the valve to the open position, a spring device connected with the mechanism to restrain the same against vibrating; and attendant-operated means for overcoming the biasing weight and spring device and starting the valve on its closing movement.

4. The combination with a pressure oil still and a pressure vapor eduction system having a vertical neck connecting with the top of the still, of a valve disk in the still movable vertically upward to a seat at the entrance to the neck, a valve-rod extending upward from the valve disk through the top of the vapor neck, a lever fulcrumed above the neck and connected with said rod, a biasing weight on said lever at the same side of the fulcrum as the connection with the valve-rod, and an attendant's positive closing means connected with the lever and operative in the opposite sense to the weight.

5. In apparatus for pressure cracking of petroleum or its higher boiling fractions, including a pressure oil still comprising a shell having a vapor outlet at the top, a vapor eduction system connected with said outlet, and means for maintaining a substantial pressure in the eduction system and still; a valve in the upper part of the shell movable upward to a seat at the entrance to the eduction system and adapted to be held thereto by the pressure in the shell after rupture in the eduction system, a weight biasing said valve to the open position, and attendant-operated means for overcoming said biasing means and starting the valve on its closing movement.

JOSEPH B. EDWARDS.

Certificate of Correction.

It is hereby certified that Letters Patent No. 1,410,175, granted March 21, 1922, upon the application of Joseph B. Edwards, of Jersey City, New Jersey, for an improvement in "Oil-Cracking Apparatus," were erroneously issued to Tide Water Oil Company, of Bayonne, New Jersey, a Corporation of New Jersey, as assignee of the entire interest in said invention, whereas said Letters Patent should have been issued to the inventor, said *Edwards* and *Tide Water Oil Company, of Bayonne, New Jersey,* said corporation being assignee of *one-fourth* interest only in said invention, as shown by the record of assignments in this office; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 24th day of April, A. D., 1922.

[SEAL.]

KARL FENNING,

Acting Commissioner of Patents.