

(16)

PATENTS ACT, 1949
AMENDED SPECIFICATION

Reprinted as amended under Section 29 on 1 November 1973.

PATENT SPECIFICATION

(11) 1 219 743

DRAWINGS ATTACHED

- (21) Application No. 1742/69 (22) Filed 10 Jan. 1969
(31) Convention Application No. 172 667 (32) Filed 6 Nov. 1968 in
(33) France (FR)
(45) Complete Specification published 20 Jan. 1971
(51) International Classification F23d 11/10
(52) Index at acceptance F4T A2A14B1 A2C



(54) A DEVICE FOR BURNING AWAY WASTE CRUDE OIL
PRODUCED WHEN INVESTIGATING OR TESTING
OIL OR PETROLEUM WELLS

(71) We, SOCIÉTÉ AUXILIAIRE
DES PRODUCTEURS DE PÉTROLE
FLOPETROL, a body corporate organized
under the Laws of the French Republic, of
Vaux-le Pénil (Seine & Marne) France, do
hereby declare the invention for which we
pray that a patent may be granted to us, and
the method by which it is to be performed,
to be particularly described in and by the
following statement:—
The present invention relates generally to
the art of investigating or testing oil or
petroleum wells and has more particular
reference to the disposal of waste crude oil
then produced.
Estimating the productive capacity of an
oil well calls for tests during which the
parameters that are necessary for the
technical study of the well are recorded.
While the disposal of the oil produced
during these tests does not pose any
problem in the case of wells on land, the
same does not apply to wells that were
drilled from drilling barges or production
platforms and that are not yet connected to
a gathering system.
Actually it is impossible to set up on
drilling barges or production platforms a
plant for storing the collected oil chiefly for
safety reasons as the oil is generally only
partly degasified. Moreover, the available
space and the permissible overloads are
generally very limited. The evacuation of
the oil by a small tanker is only conceivable
when the weather is favourable and even in
that event this may result in important stop
down expenditure owing to the uncertainty

that prevails as regards test programs. Lastly
the produced effluent may be polluted and
devoid of any trade value while presenting
problems for the evacuation of the oil on
land.

The main object of the invention is to deal
with this technical problem by providing a
device for burning away the waste crude oil.
Considering that the oil as produced
under such conditions is often polluted and
contains solid particles, a further object of
the invention is to provide a burning device
capable of accommodating the encountered
conditions by burning the oil away without
becoming clogged by solid particles.

According to the invention, a device is
provided for burning away waste crude oil
produced when investigating or testing oil or
petroleum wells comprising a burner form-
ing a spraying assembly adapted to receive
the oil from the well and to convert the same
into a jet of sprayed oil, means for connect-
ing the inlet of said burner to an oil well
head for conveying waste crude oil from
said well to said burner, air intake means
combined with said burner for intermixing
the oil and air so as to improve the combus-
tion of oil, shroud means for promoting
the combustion of the oil in a combustion
region in front of the burner, said burner
being arranged along the longitudinal axis of
said shroud means so as to direct the jet of
sprayed oil co-axially thereof, igniting
means provided for igniting in said combus-
tion region the sprayed oil to be burned
away, and water spraying means
surrounding said shroud means so as to

produce a water screen or shield for providing a protection against heat radiation from the burning oil.

5 The water spraying means may comprise a tube having a substantially annular shape and surrounding said shroud means, and nozzles provided on said tube, said nozzles extending radially or at an angle outwardly with respect to the longitudinal axis of the shroud means, so as to produce when in use
10 a water screen for providing protection against heat radiation from the burning oil.

The burner may comprise a body portion providing a chamber along the longitudinal axis of the burner, tangential channels connected to the means for connecting the inlet of the burner to the oil well head and opening into said chamber so as to impart a rotary motion to the oil within the chamber,
15 an outlet port provided on the longitudinal axis of the burner and of the chamber and communicating with said chamber, a valve member or obturator co-operating with said outlet port for adjustably opening the same, and an atomization nozzle provided on the longitudinal axis of the burner and into which said outlet port opens. In such a construction the outlet port preferably provides a seat for said valve member, said
20 seat and valve member providing between them an annular space or clearance for the escape of the crude oil as a thin flow, said oil being atomized within said nozzle.

35 The following is a description, by way of example, of a device according to the present invention, reference being made to the accompanying drawings, wherein:

Figure 1 is an edge view of the device;

40 Figure 2 is an end view thereof, assuming the burner to be omitted.

Figure 3 is a longitudinal sectional view of the burner.

45 Figures 4, 5 and 6 are detail views drawn to a larger scale along lines IV—IV, V—V and VI—VI in fig. 3.

Figures 7 and 8 are detail views drawn at a still larger scale showing the set of shutters for adjusting the intake of secondary air.

50 Referring to the drawings, the device comprises a burner 1 fitted coaxially to a combustion shroud 2, and a protective device 3, the shroud 2 and the device 3 being supported by a frame designated in its entirety by 4.

55 The burner is represented more in detail in fig. 3; it comprises a body portion 5 defining a chamber 6 in which a union 7 terminates the purpose of which is to receive by means of a screwthread a pipe 37 for the inflow of pressurized oil, said pressure ranging from a few bars to very high pressures.

60 Inside the chamber 6 is provided a member 8 angularly secured in position by a pin 9 and through which tangential channels

10 are provided. Four of these channels are provided here as shown in Fig. 4 so as to impart a rotary motion to the oil current admitted into a central chamber 38.

The chamber 38 is limited at its downstream end, i.e. its end nearer the burner outlet, by a partition 11 through which a port 12 is provided for constituting a seat with which a needle-shaped obturator 13 cooperates for the purpose of adjusting the sectional area of the tangential channels and the port 12. This obturator is connected via a rod 14 with a pneumatic actuator 15 (see Fig. 1) which may be combined with a controller located in the safety zone for permitting for example a constant oil pressure to be maintained upstream of the burner or a constant oil flow. The rod 14 is guided through a flange designated generally by 16 in Fig. 1. In the showing of Fig. 3 is illustrated a portion 16' of said flange which contains bushes 17 through which the rod 14 is slidably guided. A coil spring 18 acting by compression tends to compress a gasket 39 to ensure fluid tightness in known fashion. Fluid tightness between the several parts of the body portion may be performed by O-rings 40 made of rubber.

95 The arrangement as described permits an adjustment of the needle valve 13 and consequently of the sectional area of the tangential channels 10 and port 12 to be obtained in terms of the pressure and quality of the admitted oil. Thus if the oil contains solid particles (the diameter of which may reach 10 millimeters) the sectional area of the channels and port is temporarily increased thereby staving off any clogging whereas it is, contrary to what has just been said, decreased where the oil is no longer polluted.

Downstream of the port 12 is provided a nozzle 19 in which the oil escaping through the axial port 12 forms a thin atomized layer. The required minimum oil pressure for achieving a suitable degree of atomization is equal to a few bars. However the apparatus may also operate under a very high pressure so as to produce a very fine degree of atomization. The permissible maximum pressure may reach about 200 bars. Such pressure may be furnished from the oil well itself or by a pump.

120 It will be easily understood that the needle valve 13 might be also controlled by another device different from the one as described or alternatively manually.

The body portion 5 of the burner is provided at a position corresponding to the nozzle 19 with an air inlet union 20 to which may be screwed up a compressed air inlet pipe 21 (Fig. 1). Such a union terminates in an annular chamber 22 formed around the nozzle 19 and two sets of tangential channels
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23, 24 are provided through the wall of the nozzle at two spaced points as visible on Figs. 3, 5 and 6. The compressed air which is advantageously admitted under a pressure equal for example to 7 bars is revolved by the sets of tangential channels 23, 24 and thus drives the thin oil layer while producing a spray or mist which can be easily burnt away. The conical shape of the nozzle permits the energy derived from the compressed air the mass of which may represent for example 5% of the mass of sprayed oil to be utilized in optimum fashion.

It will be noticed from Fig. 3 that the outlet port 25 of the nozzle 19 preferably has a diameter slightly larger than the minimum diameter of the port 12.

Mounting of the burner assembly upon a platform can be done by means of a lattice beam having for example a length of twenty meters supported by cables or guys. This beam extends horizontally and carries the burner at one of its ends.

The possibility is also afforded to mount the aforesaid assembly upon the jib of a crane having adequate capacity and range. Furthermore the mounting of said assembly may be performed upon a pontoon floating upon the sea. However this technical solution is only applicable when a reliable system for anchoring the pontoon is provided.

As more specially visible in Fig. 1, the shroud 2 preferably of substantially conical shape and which can be made of carbon steel sheets coaxially surrounds the burner 1 while defining around it an annular space 27 for secondary air intake by being forwardly extended with respect to said burner in the direction of the flame when burning occurs over a sufficiently large distance. The shroud 2 is fitted with an igniting contrivance diagrammatically shown at 28 which may be of any suitable type (for example of electric type) and which maintains a pilot flame for the ignition of the sprayed or mist-like mass of oil or for its re-ignition if it is extinguished.

In use, the shroud 2 is orientated in the direction in which the prevailing wind blows so that the flame direction is the same as the wind direction. Inside the shroud and after ignition by the igniting contrivance 28 a sufficient temperature prevails so as to ensure an even combustion and to keep the flame front sufficiently stable in the space. In dotted lines is indicated by 29 in Fig. 1 the conical jet of sprayed oil corresponding to the flame that burns inside the shroud.

In the space 27 between the burner 1 and the shroud 2 extends a diaphragm (see Figs. 7 and 8) made up of flaps or shutters 30 carried by pivot pins 31 which can be rotated in ports provided in a carrier

member 32 arranged around the burner and the furnace 2 itself. Such pivot pins 31 are fast with pulleys 33 over which is trained a control cable (not shown) actuated from a suitable device. Thus control of the flaps 30 permits the sectional area of the secondary air intake to be varied and more particularly to be so reduced as to protect the flame against gusty winds the effect of which would be harmful to combustion stability while nevertheless permitting such a secondary air inflow as will improve the combustion where no wind or only light wind prevails.

In order to ensure protection against heat radiation due to the combustion of oil, there is provided a protecting device 3 constituted by a tube 34 having a polygonal shape carrying nozzles 35 distributed along its periphery and receiving water under pressure through a conduit 36. Water (for example sea water) is sprayed through the nozzles 35 at a high rate of flow so as to build a screen extending (as shown in Figs. 1 and 2) quite close to the hot source, thereby forming a large cone of shadow which protects the surrounding installations and the staff.

It will be seen that the device as described permits the oil from a well to be completely burnt away in an adjustable manner in terms of the rate of flow of the oil, pressure conditions, etc. even if the oil is polluted by solid particles.

WHAT WE CLAIM IS:—

1. A device for burning away waste crude oil produced when investigating or testing oil or petroleum wells comprising a burner forming a spraying assembly adapted to receive the oil from the well and to convert the same into a jet of sprayed oil, means for connecting the inlet of said burner to an oil well head for conveying waste crude oil from said well to said burner, air intake means combined with said burner for intermixing the oil and air so as to improve the combustion of oil, shroud means for promoting the combustion of oil in a combustion region in front of the burner, said burner being arranged along the longitudinal axis of said shroud means so as to direct the jet of sprayed oil co-axially thereof, igniting means provided for igniting in said combustion region the sprayed oil to be burned away, and water spraying means surrounding said shroud means so as to produce a water screen or shield for providing a protection against heat radiation from the burning oil.

2. A device according to claim 1, wherein said water spraying means comprise a tube having a substantially annular shape and surrounding said shroud means, and nozzles provided on said tube, said nozzles extending radially or at an angle outwardly with

23, 24 are provided through the wall of the nozzle at two spaced points as visible on Figs. 3, 5 and 6. The compressed air which is advantageously admitted under a pressure equal for example to 7 bars is revolved by the sets of tangential channels 23, 24 and thus drives the thin oil layer while producing a spray or mist which can be easily burnt away. The conical shape of the nozzle permits the energy derived from the compressed air the mass of which may represent for example 5% of the mass of sprayed oil to be utilized in optimum fashion.

It will be noticed from Fig. 3 that the outlet port 25 of the nozzle 19 preferably has a diameter slightly larger than the minimum diameter of the port 12.

Mounting of the burner assembly upon a platform can be done by means of a lattice beam having for example a length of twenty meters supported by cables or guys. This beam extends horizontally and carries the burner at one of its ends.

The possibility is also afforded to mount the aforesaid assembly upon the jib of a crane having adequate capacity and range. Furthermore the mounting of said assembly may be performed upon a pontoon floating upon the sea. However this technical solution is only applicable when a reliable system for anchoring the pontoon is provided.

As more specially visible in Fig. 1, the shroud 2 preferably of substantially conical shape and which can be made of carbon steel sheets coaxially surrounds the burner 1 while defining around it an annular space 27 for secondary air intake by being forwardly extended with respect to said burner in the direction of the flame when burning occurs over a sufficiently large distance. The shroud 2 is fitted with an igniting contrivance diagrammatically shown at 28 which may be of any suitable type (for example of electric type) and which maintains a pilot flame for the ignition of the sprayed or mist-like mass of oil or for its re-ignition if it is extinguished.

In use, the shroud 2 is orientated in the direction in which the prevailing wind blows so that the flame direction is the same as the wind direction. Inside the shroud and after ignition by the igniting contrivance 28 a sufficient temperature prevails so as to ensure an even combustion and to keep the flame front sufficiently stable in the space. In dotted lines is indicated by 29 in Fig. 1 the conical jet of sprayed oil corresponding to the flame that burns inside the shroud.

In the space 27 between the burner 1 and the shroud 2 extends a diaphragm (see Figs. 7 and 8) made up of flaps or shutters 30 carried by pivot pins 31 which can be rotated in ports provided in a carrier

member 32 arranged around the burner and the furnace 2 itself. Such pivot pins 31 are fast with pulleys 33 over which is trained a control cable (not shown) actuated from a suitable device. Thus control of the flaps 30 permits the sectional area of the secondary air intake to be varied and more particularly to be so reduced as to protect the flame against gusty winds the effect of which would be harmful to combustion stability while nevertheless permitting such a secondary air inflow as will improve the combustion where no wind or only light wind prevails.

In order to ensure protection against heat radiation due to the combustion of oil, there is provided a protecting device 3 constituted by a tube 34 having a polygonal shape carrying nozzles 35 distributed along its periphery and receiving water under pressure through a conduit 36. Water (for example sea water) is sprayed through the nozzles 35 at a high rate of flow so as to build a screen extending (as shown in Figs. 1 and 2) quite close to the hot source, thereby forming a large cone of shadow which protects the surrounding installations and the staff.

It will be seen that the device as described permits the oil from a well to be completely burnt away in an adjustable manner in terms of the rate of flow of the oil, pressure conditions, etc. even if the oil is polluted by solid particles.

WHAT WE CLAIM IS:—

1. A device for burning away waste crude oil produced when investigating or testing oil or petroleum wells comprising a burner forming a spraying assembly adapted to receive the oil from the well and to convert the same into a jet of sprayed oil, means for connecting the inlet of said burner to an oil well head for conveying waste crude oil from said well to said burner, air intake means combined with said burner for intermixing the oil and air so as to improve the combustion of oil, shroud means for promoting the combustion of oil in a combustion region in front of the burner, said burner being arranged along the longitudinal axis of said shroud means so as to direct the jet of sprayed oil co-axially thereof, igniting means provided for igniting in said combustion region the sprayed oil to be burned away, and water spraying means surrounding said shroud means so as to produce a water screen or shield for providing a protection against heat radiation from the burning oil.

2. A device according to claim 1, wherein said water spraying means comprise a tube having a substantially annular shape and surrounding said shroud means, and nozzles provided on said tube, said nozzles extending radially or at an angle outwardly with





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respect to the longitudinal axis of the shroud means, so as to produce when in use a water screen for providing protection against heat radiation from the burning oil.

- 5 3. A device according to claim 1, wherein said burner comprises a body portion providing a chamber along the longitudinal axis of the burner, tangential channels connected to the means for connecting the inlet of the burner to the oil well head and opening into said chamber so as to impart a rotary motion to the oil within the chamber, an outlet port provided on the longitudinal axis of the burner and of the chamber and communicating with said chamber, a valve member or obturator co-operating with said outlet port for adjustably opening the same, and an atomization nozzle provided on the longitudinal axis of the burner and into which said outlet port opens.

- 10 4. A device according to claim 3, wherein said outlet port provides a seat for said valve member, said seat and valve member providing between them an annular space or clearance for the escape of the crude oil as a thin flow, said oil being atomized within said nozzle.

- 15 5. A device according to claim 3 or 4, wherein said valve member is connected with an actuator the position of which is controlled from a control unit, for instance of the pneumatic type.

- 20 6. A device according to claim 5, wherein

said actuator is operated by a control unit maintaining a constant oil pressure upstream of the burner. 35

7. A device according to claim 5, wherein said actuator is operated by a control unit maintaining a constant rate of flow of oil.

8. A device according to claim 5, wherein said actuator is connected with a manual control member. 40

9. A device according to any one of the preceding claims, wherein said burner comprises tangential channels for the inflow of air. 45

10. A device according to any one of the preceding claims, wherein an annular space is provided between the burner and the shroud means, for the inflow of secondary air, and a diaphragm is fitted in said space. 50

11. A device according to claim 10, wherein said diaphragm is made up of flaps carried by pivot pins, the position of said flaps being angularly adjustable so as to adjust or control the inflow of secondary air. 55

12. A device for burning away waste crude oil produced when investigating or testing oil or petroleum wells substantially as hereinbefore described with reference to the accompanying drawings. 60

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