June 30, 1936. J. N. HASSE 2,045,772

MEANS FOR EXTINGUISHING OIL WELL FIRES

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FIG. 1

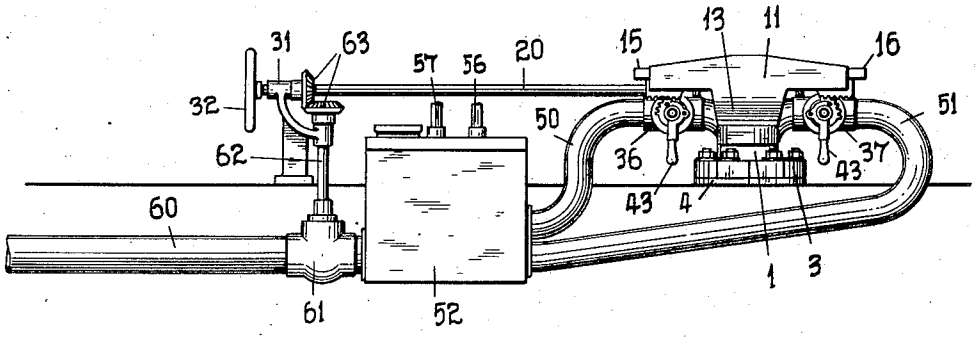


FIG. 2

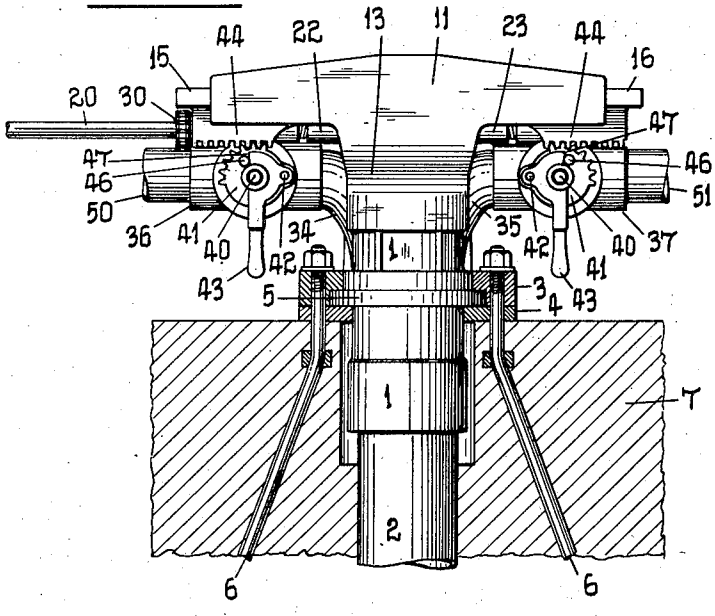


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FIG. 3

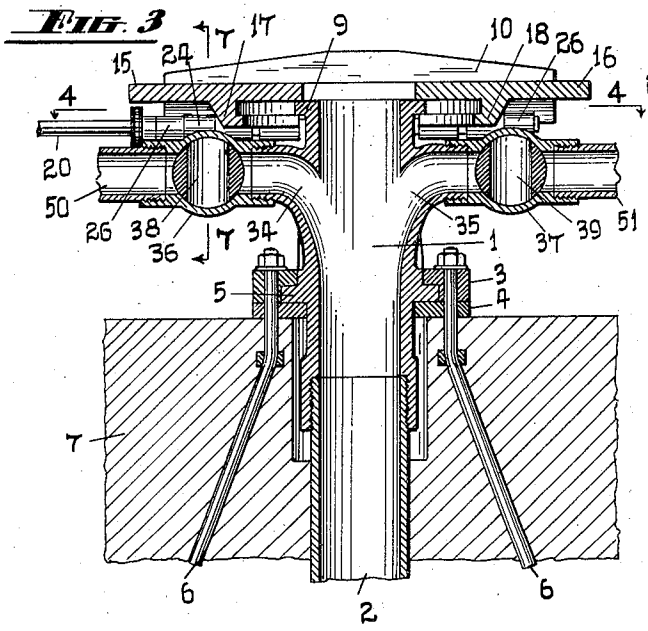



FIG. 6

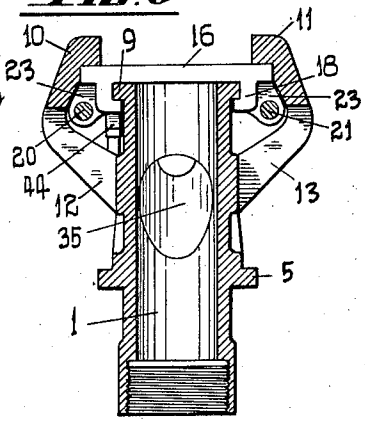



FIG. 4

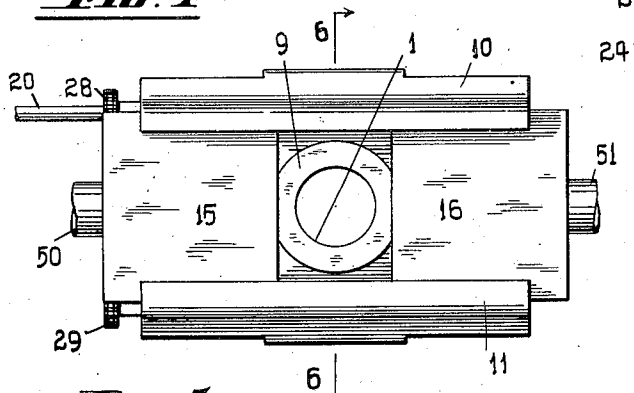



FIG. 7

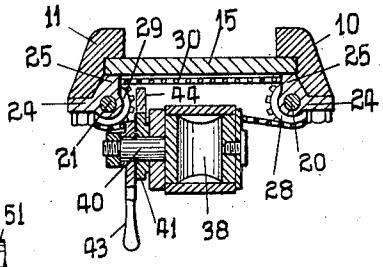



FIG. 8

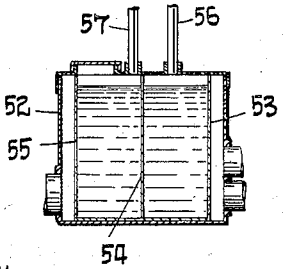
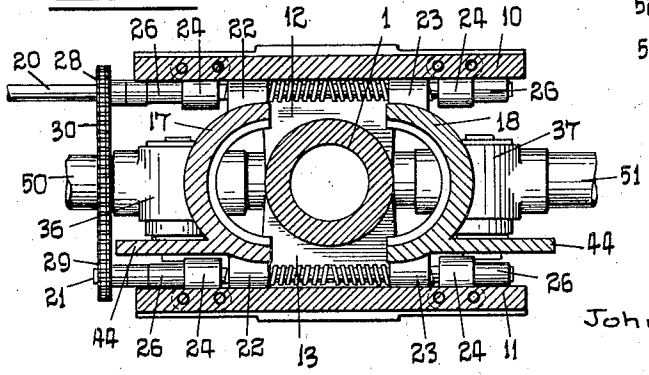



FIG. 5

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Patented June 30, 1936 2,045,772

# UNITED STATES PATENT OFFICE

2,045,772

## MEANS FOR EXTINGUISHING OIL WELL FIRES

John Nelson Hasse, St. Peters, South Australia, Australia

Application March 28, 1935, Serial No. 13,465

9 Claims. (Cl. 169—4)

This invention relates to an improved safety device for oil wells, its purpose being to reduce the fire hazard, chiefly when drilling, which now exists in fields where there is a natural flow of oil or gas.

It is well known that the oil or gas or both which issue from a self flowing well can, and very often do, catch fire with attendant great losses and damage to property, the well sometimes burning out completely or, when finally brought under control, having a flow relatively small compared to its initial flow. Causes of fire are numerous, such for instance as sparks caused by the drilling tool striking the casing or by friction of the steel cables or even due to naked flame in the vicinity of the well, also sometimes due to heating of the casing mouth due to the friction of the flowing oil. A great danger also exists in that heavier gas may flow from the well and creep a considerable distance along the ground to contact with a naked flame. It is the object of my invention to provide means by the use of which a fire, when one has started, can immediately and successfully be extinguished, a further object being to effect this without in any way impairing the later flow of the well as is done when the top of the casing is sealed up or when mud is pumped down the well.

According to my invention a special valve gear is positioned on the top of the well casing, which valve gear does not in any way interfere with the drilling operation but permits the top of the casing to be readily closed if desired. It does not cause the flow of oil or gas to cease but causes same to be bypassed to an oil storage reservoir, or to a safe distance, preferably through a fire extinguishing chemical.

It will be obvious that when the top of the casing is closed so that all flow of oil or gas from its vicinity is prevented the fire must cease for lack of fuel.

In order that my invention may be the more clearly understood I will now describe the same with reference to the accompanying drawings in which:

Fig. 1 is a side elevation of my invention.

Fig. 2 is an enlarged side elevation of the valve gear at the head of the casing, showing also its anchoring means and the top of the casing.

Fig. 3 is a central section of same.

Fig. 4 is a plan of same.

Fig. 5 is a section as on line 4—4 of Fig. 3.

Fig. 6 is a central vertical section of the valve head gear only taken as on line 6—6 of Fig. 4.

Fig. 7 is a view similar to Fig. 6 but taken as on line 7—7 of Fig. 3, and

Fig. 8 is a central section of the tank.

Figs. 2 to 7 inclusive are drawn to a larger scale than Figs. 1 and 8.

The body 1 of the valve gear at the head of the casing 2 is screwed to the casing 2, the body 1 being securely anchored in place by means of clamping members 3 and 4 which engage a flange 5 upon the body 1, the clamping members 3 and 4 being held in place by anchoring bolts 6 and by a concrete or other foundation 7.

The body 1 is hollow and its top has a flange 9, and adjacent the flange are two guides 10 and 11 which are formed integrally with the body 1 being connected thereto by arms 12 and 13.

The guides 10 and 11 are shaped to slidably hold a pair of doors 15 and 16, the doors fitting neatly upon the top of the flange 9 and having semicircular downwardly projecting portions 17 and 18 shaped to engage the edge and underside of the flange 9 when the doors are closed. The doors are slidable to move over and close the opening in the body, they sliding inwardly from each end and meeting over the centre of the body.

The movement of the doors 15 and 16 is effected by a pair of screwed rods 20 and 21 each having upon it a right hand and a left hand screw thread, preferably of the square type, the screw threads engaging internally threaded bosses 22 and 23 upon the doors 15 and 16 respectively. The screwed rods 20 and 21 are supported in bearings 24 which are secured to the guides 10 and 11 and which bearings also have portions 25 which form guides for the under surfaces of the doors 15 and 16. Collars 26 upon the screwed rods provide for correct axial alignment. In operation it is necessary that the rods 20 and 21 are rotated in unison, therefore they are interconnected by a chain and sprocket drive comprising sprockets 28 and 29 upon the rods 20 and 21 respectively and a chain 30. The one rod 20 is extended to provide remote control, its extended end being supported in a bearing 31 and it having a hand wheel 32 whereby it may be rotated.

On each side of the body 1, communicating with the bore within it, are curved tubular extensions 34 and 35 upon the ends of which are barrel type valves 36 and 37 respectively. The barrels 38 and 39 of the valves are coupled to move with the doors 15 and 16, the timing being such that the valves 36 and 37 are closed when the doors 15 and 16 are in the open position, and

vice versa. The barrel 38 of the valve 36 is moved by the door 15 and the barrel 39 of the valve 37 is moved by the door 16. The couplings between the valves and the respective doors are identical. The barrels 38 and 39 of the valves each have a stem 40 and this has mounted upon it a toothed segment 41 which is free to rotate upon the stem but is normally locked by a pin 42 to a handle 43 securely attached to the stem 40. Toothed racks 44 integral with the doors 15 and 16 engage the toothed segments 41. The valves are thus rotated when the doors are moved. If it is desired to only open the valves by movement of the doors and not to close same when the doors are returned the pins 42 are withdrawn from the segments 41, pins 46 (also upon the handles) then operating to open the valves when the doors are closed by such pins pushing against the faces 47 of the handles. Reverse movement of the doors however only causes the pins 46 to leave the faces 47 and consequently no movement of the valves then takes place. The valves can be closed by hand.

Leading from the valves 36 and 37 are pipes 50 and 51 which connect with a tank 52. This tank may contain fire extinguishing liquids of the foam forming type, such as acid alum solution and alkali licorice solution. It will be known that such chemicals must not mingle until the foam is actually required and for this purpose I propose to construct the tank 42 to have within it a removable double container of fragile material, the container comprising fragile walls 53 and 55 and a fragile central partition 54 and being of a size to extend across the tank from side to side and from top to bottom. The one compartment so formed contains the acid alum solution and the other the alkali licorice solution. The mingling of the solutions is effected by the gas or oil pressure breaking the fragile walls of the container when it is admitted to the tank 42, such mingling causing the interaction of the chemicals to form the foam.

Instead of the tank 52 containing the chemicals to form fire extinguishing foam it may be provided with pipes 56 and 57 which connect with a chemical storage and pumping plant, the tank 52 then simply acting as a mixing chamber for the chemicals.

Further, if it is thought unnecessary to use fire extinguishing means no chemical would be placed or pumped into the tank, in which case the oil or gas flows directly therethrough.

Leading from the tank 52 to the main oil storage reservoir is a pipe line 60 which has in it a valve 61 connected to open when the valves 36 and 37 are opened, the stem 62 of the valve 61 having gear connection 63 to the rod 20.

The oil storage reservoir has not been shown in the drawings as such reservoir can be of any usual or approved construction. It may, in a developed field, be in the form of a large tank or, in the case of an undeveloped field it may (as is usually the case) simply be in the form of a dam. In either case the pipe line 60 leads into such reservoir, either into the bottom or into the top of same.

In operation the drilling of the well is started and before the oil-bearing strata is reached, preferably soon after commencement of the drilling, the body 1 of the valve head gear is secured to the top of the well casing and is securely anchored in place upon the foundation 7 by the bolts 6, the necessary connection being made from the valves 36 and 37 to the tank 52, the tank 52 having the pipe line 60 to the storage reservoir attached to it and the tank (if required) being charged with the chemicals or connected to a chemical supply. The doors 15 and 16 are moved to uncover the opening by rotating the wheel 32, the doors being moved by the screwed rods 20 and 21 connected with the wheel. The movement of the doors 15 and 16, due to the racks 44 upon them engaging the toothed segments 41 upon the barrels 38 and 39 of the valves 36 and 37, causes such valves to be closed, or if the pins 42 have not been inserted the valves are closed manually by operating the handles 43. Rotation of the wheel 32 also closes the valve 61 through the gear connection 63 to its stem 62.

Drilling can now proceed in the ordinary way.

It is when oil-bearing strata is reached, and oil or gas begins to flow, that the great danger of fire is present. Should a fire occur it can at once be extinguished by means of my apparatus, and this without losing valuable oil or in any way impairing the flow, the operation of the apparatus being as follows.

The wheel 32 is quickly rotated to move the doors 15 and 16 inwards until they meet and form an effective seal to the top of the hollow body 1 of the device. The stopping of the flow causes the fire at the well mouth to be extinguished owing to lack of fuel. Due to the inward movement of the doors 15 and 16 transmitting a rotary motion to the valves 36 and 37 (through the racks 44 and the segments 41) these valves are opened and the flow of the oil or gas is not prevented but is bypassed to the tank 52. The pressure of the oil or gas breaks the fragile walls 53 and 55 and partition 54 (if used) allowing the chemicals in the tank to mingle and generate foam, such foam and oil or gas flowing from the tank through the valve 61 (which has been opened simultaneously with the closing of the doors) and through the pipe line 60 to the storage reservoir. Fire is here prevented by the foam which is carried into the storage reservoir by the oil or gas and which foam forms an effective blanket to prevent combustion of the oil or gas.

When the fire is extinguished the doors 15 and 16 (and consequently the associated parts) may be returned to their original positions.

Throughout this specification and in the drawings a pair of valves 36 and 37 have been shown but it will be seen that, provided one valve is sufficiently large to carry off the flow of oil or gas, the other valve may be omitted.

What I claim is:

1. Means to extinguish oil well fires comprising; a tubular body fitted to the top of the well casing, a pair of slidable doors adapted to close the top of the body, means to operate the doors, valves communicating with the body, means to operate the valves so that when the doors close the valves open, pipes connecting the valves with a chamber, a feed line from the chamber to a storage reservoir, pipes connecting the chamber with sources of fire extinguishing liquid, and a valve in the feed line connected to open simultaneously with the valves in the hollow body.

2. Means according to claim 1 characterized in that the doors are slidable in guides forming part of the tubular body, and in that the doors have portions which (when the doors are closed) engage the side and underside of a flange upon the top of the body.

3. Means according to claim 1 characterized in that the doors are moved by mechanism comprising; internally threaded lugs upon the doors, a rod upon each side of the doors having a right and left hand thread engaged by the lugs, bearings to support the rods, collars to prevent axial movement of the rods, a hand wheel upon an extension of one of the rods, and sprocket and chain connection between the rods.

4. Means according to claim 1 characterized in that the valves upon the tubular body have barrels which have operating stems and in that the doors have means to operate the valves comprising a rack upon each door and a toothed segment upon the operating stem of each valve barrel, the one toothed segment engaging the one rack and the other toothed segment engaging the other rack.

5. Means according to claim 1 characterized in that the valves upon the tubular body have barrels which have operating stems, and in that the doors have means to operate the barrels of the valves comprising, a rack upon each door and a toothed segment loosely mounted upon the operating stem of each valve barrel, the one toothed segment engaging the one rack and the other toothed segment engaging the other rack, a handle securely fastened to the stem of each valve barrel adjacent the toothed segment upon such stem, a withdrawable pin passing through each handle and entering the respective segment, and a second pin upon each segment adapted to engage a shoulder upon the respective handle.

6. Means according to claim 1 characterized by; a flange upon the tubular body, clamping means to engage the flange, bolts to anchor the clamping means, and a foundation.

7. Means to extinguish oil well fires comprising; a tubular body fitted over the well casing, a pair of slidable doors adapted to close the top of the tubular body, a pair of rods having right and left hand threads to move the doors, one rod being extended and having a hand wheel, means to cause the rods to be rotated in unison, a pair of valves communicating with the bore of the tubular body, couplings between the valves and the doors to open the valves as the doors close, pipes from the valves to a tank, a pipe line from the tank to a storage reservoir, pipes connecting the chamber with sources of fire extinguishing liquid, and in the pipe line a valve connected to open as the doors are closed.

8. Means according to claim 7 characterized in that the valves which communicate with the tubular body have barrels upon which are stems and in that the connections to the doors comprise toothed segments upon the stems engaging toothed racks upon the doors.

9. Means according to claim 7 characterized in that the valve in the pipe line has gear connection from its stem to the extended rod.

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