

June 22, 1937.

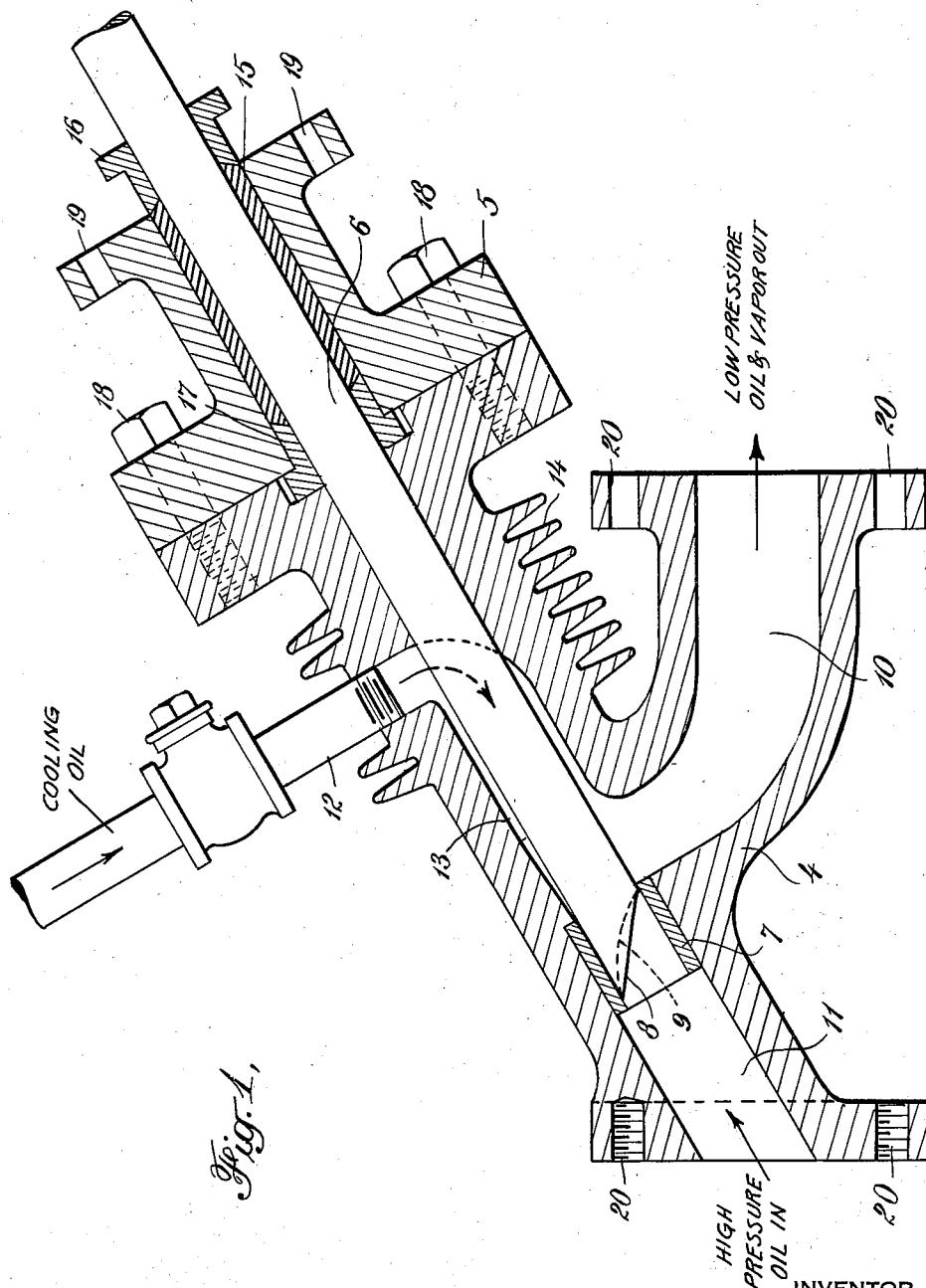
W. HILDEBRANDT

2,084,397

CONTROL VALVE

Filed Jan. 14, 1936

3 Sheets-Sheet 1



INVENTOR
WILLIAM HALDEBRANDT
BY *Raymond J. Burkhard*
ATTORNEY

June 22, 1937.

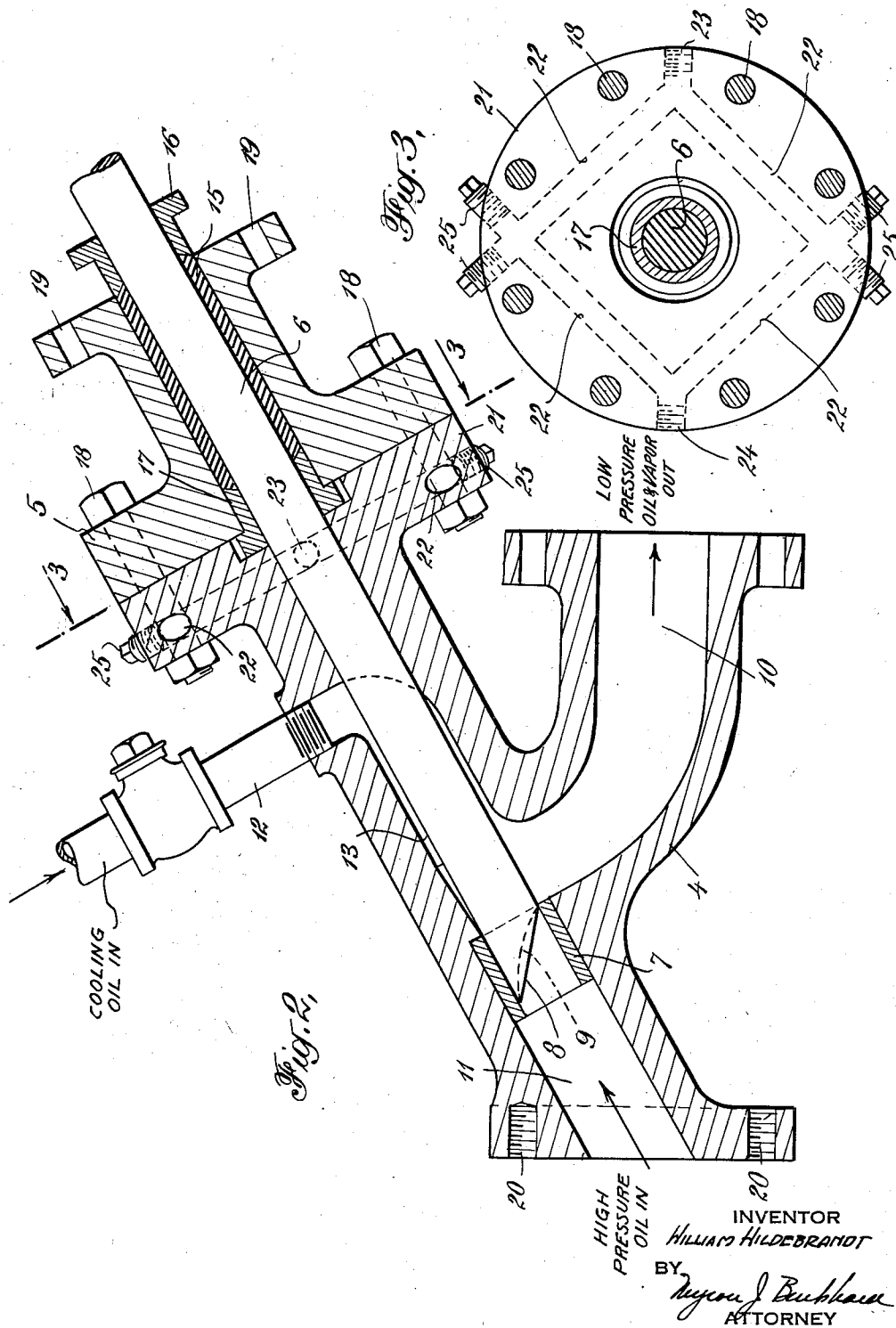
W. HILDEBRANDT

2,084,397

CONTROL VALVE

Filed Jan. 14, 1936

3 Sheets-Sheet 2



June 22, 1937.

W. HILDEBRANDT

2,084,397

CONTROL VALVE

Filed Jan. 14, 1936

3 Sheets-Sheet 3

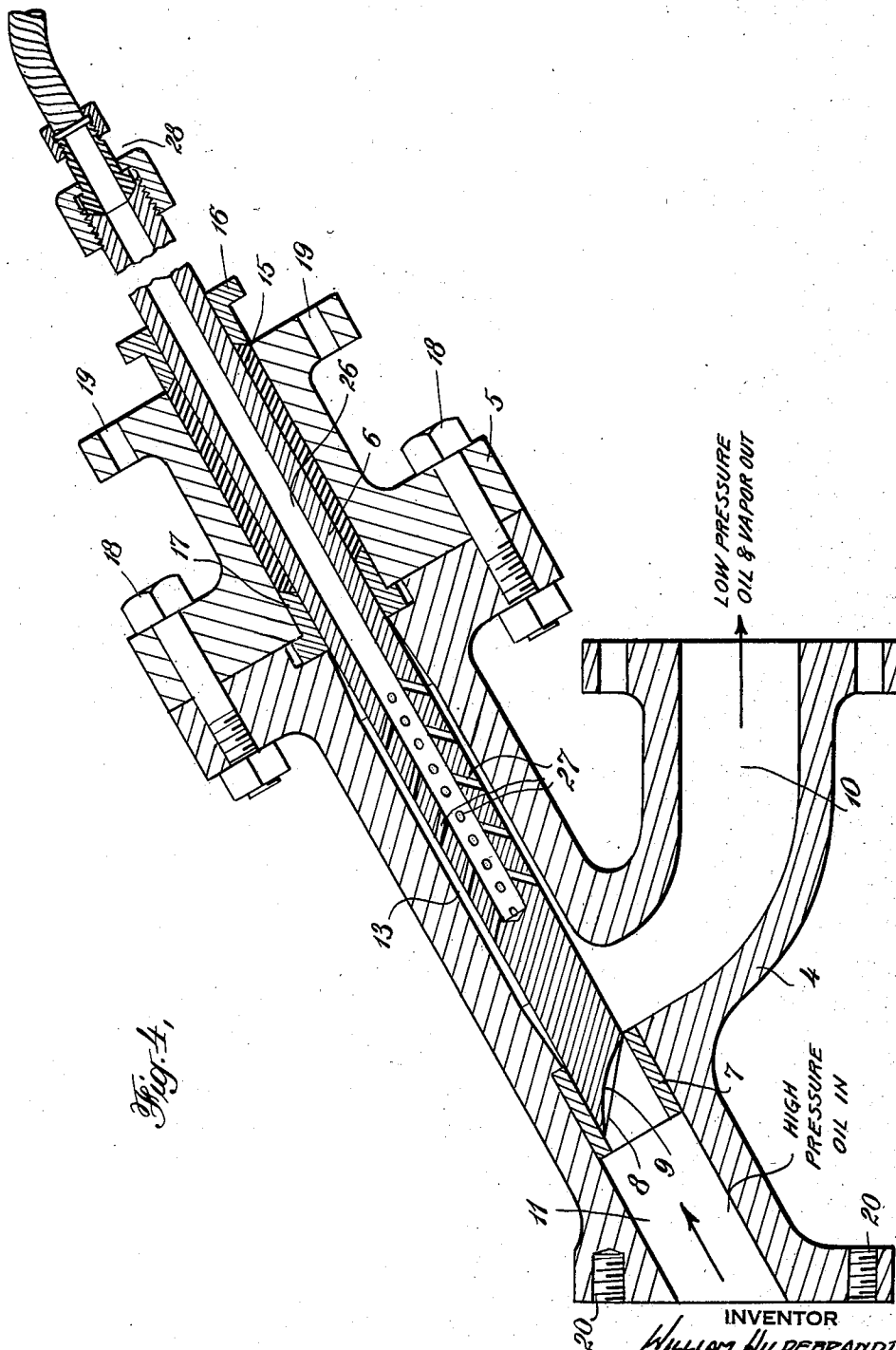


Fig. 4,

INVENTOR

WILLIAM HILDEBRANDT

BY

Raymond J. Burkhard
ATTORNEY

UNITED STATES PATENT OFFICE

2,084,397

CONTROL VALVE

William Hildebrandt, Hammond, Ind., assignor
to Socony-Vacuum Oil Company, Incorporated,
New York, N. Y., a corporation of New York

Application January 14, 1936, Serial No. 59,059

6 Claims. (Cl. 251-75)

Modern systems for the cracking of hydrocarbon oils frequently make use of the step of heating oils in a region of high temperature and pressure and then releasing them to a region of lower pressure. Pressure is imposed upon the system by a feed pump, and the release is controlled by a release valve, adjustment of which is used to control the pressure within the preceding portion of the cracking system. This invention is concerned with a novel and improved form of valve for such control purposes.

The materials flowing through such valves are oils, at temperatures usually in the range of 800° to 900° F. and upwards, under pressures ranging from 100 pounds per square inch gauge upwards to pressures of the order of 1,000 pounds per square inch or more. The degree of reduction through the valve may only be 100 pounds gauge or so, but is usually greater, of the order of from 500 to 1,000 pounds on the pressure side to 50 pounds gauge on the low pressure side. The material handled is practically always at such pressures that it is substantially liquid, or above the critical pressure and at a density practically that of a liquid on the pressure side, and a great portion vaporizes upon release of pressure. The material handled also frequently carries minute particles of a cokey nature. The combined effect of these conditions of operation is a wire drawing effect with rapid erosion of valves not designed to properly meet these circumstances.

It is an object of this invention to provide a valve capable of continued efficient operation under such circumstances, embodying the features of minimum resistance to flow, high resistance to erosive agencies, ability to be self-cleaning, simple in design, non-conductive to accumulation of deposits upon the low pressure side, capable of proper cooling to protect packing, capable of simple and ready maintenance. It is a further object of this invention to provide a valve for the above use wherein a cooling oil may be admixed with the expanding oil in the region of expansion, and wherein the cooling oil may be lead to its point of admixture in such a manner that it may assist in the protection of the valve from the hazards of its service.

In order to more fully understand this invention and the manner in which these objects are accomplished in my novel and improved valves, reference is now made to the drawings which are attached to and made a part of this specification. In these drawings, sectional views of several variations of my novel valve construc-

tion are given. Figures 1, 2 and 4 show these various forms. Of these figures, Figures 1, 2, and 4 are longitudinal sections, each showing one of the various forms of valves mentioned. Figure 3 is a sectional detail showing the form of construction of a flange used on the valve shown in Figure 2. All of these valves are of the "rising stem" type commonly known, and equipped with the usual packing gland collar, yoke, stem collar, and handwheel commonly associated with the stem of all rising stem valves. This invention is not concerned with these portions of the assembled valve, but only with the valve body proper and the portion of the stem therein, and the above noted items are omitted from the drawings.

Figure 1 shows a simple form of my improved valve. This valve is composed of a body casting 4 and a stem packer casting 5, through which works a stem 6. This stem 6 works against an inserted seat 7, which is preferably secured within the body by a shrinkage fit, but if desired, may be secured by any other convenient method, as by threads, etc. The end of the valve stem is bevelled, as shown at 8, and this bevelled surface is recessed, as shown by dotted line 9, forming a surface of spherical nature so that the direction of flow of the escaping oil may be changed with a minimum of resistance. High pressure hot oil enters the valve body 4 through passage 11. The released low pressure oil escapes through passage 10. A cooler oil is introduced through passage 12 which merges smoothly with the enlarged space 13 which surrounds the stem 6 for some little distance before it meets the hot oil from passage 11. The purpose of this cooling oil may be two-fold. With respect to the valve alone, it serves to prevent the overheating of the stem packing and the leaking of hot, highly inflammable oil from the stem end of the valve which otherwise would be difficult to guard against. By protecting this packing, and preventing the transmission of unduly high temperatures along the stem, the valve is always maintained in good working condition, and the life of the stem is greatly prolonged. The second purpose of the cooling oil is associated with the system of cracking employed, since in many pressure cracking systems, followed by release of pressure, it is desired to add colder oil at the point of release to check further cracking, to hold down or control the degree of vaporization in the released oil, or to combine these functions with the attainment of some desired action on the colder oil by the excess heat of cracking, as, for example, strip-

ping of the colder oil of its lighter components. Consequently the proportion of colder oil admitted may vary from only that amount necessary to protect the stem, stem packing, etc., to some far greater amount which is dictated by other considerations. The colder oil will of course have a higher pressure than the released heated oil, and will be governed by some valve not closely associated with the release valve.

To assist in the cooling of the valve body to prevent heat transmission toward the stem packing, I also make use of radiation fins 14, cast upon the valve body 4.

The stem packer casting 5 contains a packing filled space 15, with glands 16 and 17, as is usual. This stem packer casting is fixed securely to body casting 4 by bolts 18. Suitable yoke, stem collar, hand wheel, gland assembly, and the like of any of the forms well known in the art may be affixed to casting 5 by means of bolts inserted in holes 19. The valve body 4 may be positioned and fixed in its proper place in the cracking assembly by bolts inserted through holes 20.

Figure 2 shows a modified form of Figure 1, in which a more positive cooling to prevent transmission of heat than by the fins 14 of Figure 1 is supplied. This more positive means of cooling consists of drillings in the flange 21, which are shown in detail in Figure 3. Other details of Figure 2 are identical with Figure 1 and are indicated by the same numerals. Figure 3 shows a plan view of the flange 21 of Figure 2. This flange is provided with four passages 22, each of which extends to the surface of the side of the flange and is provided with a plug 25, which may be removed for cleaning. These passages communicate with inlet 23 and outlet 24 so that a cooling medium, such as water, or colder oil on its way to inlet 12 may be passed through the body of flange 21 to cool it and prevent transmission of heat from valve body 4 to the stem packing.

Figure 4 shows a preferred form of my novel valve. The body 4 of this form is exactly similar to that of Figure 1, except that the cold oil inlet 12 and fins 14 are omitted. The stem packer casting 5 is the same as in Figure 1. In these parts, the same numbers are used for the same parts as in Figures 1 and 2. In this form, shown in Figure 4, the colder oil is introduced through a central passage 26 drilled in valve stem 6, which passage stops short of the portion of the valve stem normally in contact with hot oil. A series of small drilled holes 27 serve to lead the oil from this central passage into space 13. On account of the cooling effect of the oil within stem 6, the fins 14 of Figure 1 and the cooled flange 21 of Figures 2 and 3 are not needed to protect the stem packing, and may be dispensed with. Colder oil is introduced to the outboard end of the stem 6 by a flexible tubing or piping system of any suitable sort, joined to the stem end by a union assembly, as shown at 28.

This valve may be cleaned readily by screwing the stem 6 down so that it passes entirely through the seat 7.

The valve may be made in any metal or combination of metals suitable for the temperatures encountered, the usual metals being cast or forged steel for the body and stainless steel for the stem and fittings. The form of the valve may be altered without departing from the invention to provide either the straight flow forms of valve shown, or an angle valve in which the inlet 11 is at any angle to the stem and outlet 10.

I claim:

1. A pressure release valve for oil cracking systems, comprising a valve body having an inlet for high pressure fluid, an outlet for released fluid, and therebetween a valve mechanism composed of a valve, a valve seat, and a valve stem, on said valve body an extended sleeve surrounding said valve stem, and spaced therefrom to provide an annular passage within said sleeve around said valve stem, said annular passage having free and open communication with the main liquid passage of the valve, and means for admitting to said annular passage a fluid colder than the fluid to be controlled.

2. A pressure release valve for oil cracking systems, comprising a valve body having an inlet for high pressure fluid, an outlet for released fluid and therebetween a valve mechanism composed of a cylindrical seat and a cylindrical valve which may be advanced wholly within said cylindrical seat for closure, a valve stem on said valve, an extended sleeve on said valve body surrounding said valve stem, and spaced therefrom to provide an annular passage within said sleeve around said stem, said annular passage having free and open communication with the main liquid passage of the valve, and means for admitting to said annular passage a fluid colder than the fluid to be controlled.

3. A pressure release valve for oil cracking systems, comprising a valve body having an inlet for high pressure fluid, an outlet for released fluid, and therebetween a valve mechanism composed of a cylindrical seat and a cylindrical valve which may be advanced wholly within said cylindrical seat for closure, a valve stem on said valve, an extended sleeve on said valve body surrounding said valve stem, and spaced therefrom to provide an annular passage within said sleeve around said stem, said annular passage having free and open communication with the main liquid passage of the valve, means for admitting to said annular passage a fluid colder than the fluid to be controlled, and heat dissipating fins placed externally on said sleeve.

4. A pressure release valve for oil cracking systems, comprising a valve body having an inlet for high pressure fluid, an outlet for released fluid, and therebetween a valve mechanism composed of a cylindrical seat and a cylindrical valve which may be advanced wholly within said cylindrical seat for closure, a valve stem on said valve, an extended sleeve on said valve body surrounding said valve stem, and spaced therefrom to provide an annular passage within said sleeve around said stem, said annular passage having free and open communication with the main liquid passage of the valve, means for admitting to said annular passage a fluid colder than the fluid to be controlled, said sleeve terminating in a flange for the attachment of valve stem packing means and valve operating means, and in said flange passages for the circulation of cooling fluid.

5. A pressure release valve for oil cracking systems, comprising a valve body having an inlet for high pressure fluid, an outlet for released fluid, and therebetween a valve mechanism composed of a valve, a valve seat, and a valve stem, on said valve body an extended sleeve surrounding said valve stem, and spaced therefrom to provide an annular passage within said sleeve around said valve stem, said annular passage having free and open communication with the main liquid passage of the valve, means for admitting to said annular passage a fluid colder

than the fluid to be controlled, said means consisting of a central passage within said stem and a plurality of smaller passages whereby fluid may escape from said passage to the space surrounding the stem, and means to admit fluid to the central passage of the stem.

6. A pressure release valve for oil cracking systems, comprising a valve body having an inlet for high pressure fluid, an outlet for released fluid, and therebetween a valve mechanism composed of a cylindrical seat and a cylindrical valve which may be advanced wholly within said cylindrical seat for closure, a valve stem on said valve, an extended sleeve on said valve body

surrounding said valve stem, and spaced therefrom to provide an annular passage within said sleeve around said stem, said annular passage having free and open communication with the main liquid passage of the valve, means for admitting to said annular passage a fluid colder than the fluid to be controlled, said means consisting of a central passage within said stem and a plurality of smaller passages whereby fluid may escape from said passage to the space surrounding the stem, and means to admit fluid to the central passage of the stem.

WILLIAM HILDEBRANDT.