Attention: Oil company CEO's who must be concerned about blow outs at their deep water wells. There is an added measure of safety. It costs peanuts. It is a reliable, reversible Shut Off Valve. It does what BP took a month to do at Deep Water Horizon. You need this valve in your wells now.

From Dr. Bill Wattenburg, www.wattenburg.us , wattenburg@aol.com , September 13, 2015

FIGURE 1. THE BALL BAFFLE BLOW OUT PREVENTER (BBBOP)

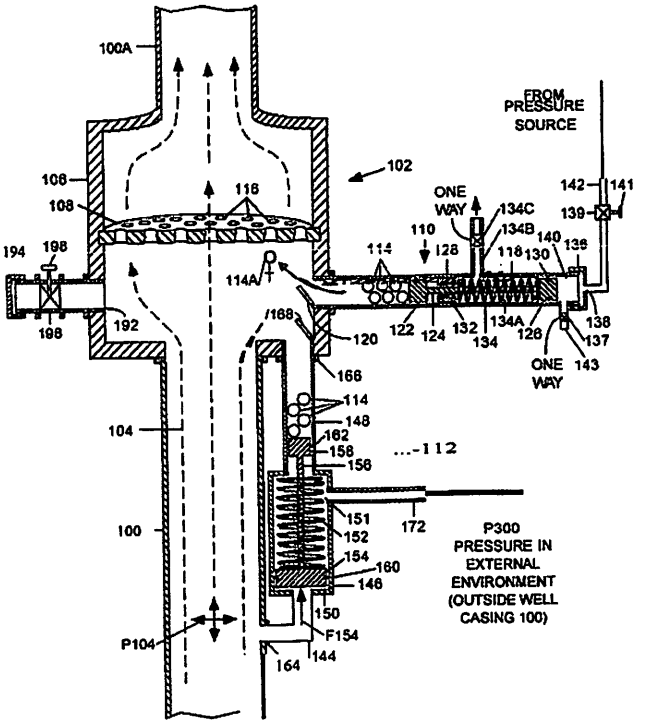


Fig. 1

A concerned CEO does not need engineering experts to explain the operation of the simple Ball Baffle Blow Out Preventer (Shut Off Valve) described in this report and U.S Patent 8042615 (2011). The basic operation is self-evident in FIGURE 1 above. As demonstrated herein, the Ball Baffle shut off valve simply does what the BP engineers at Deep Water Horizon finally accomplished a month too late.

In FIGURE 1 above, hollow metal balls 114A (like 2 inch diameter) are inserted into the oil stream below a Baffle Plate 108 that has many holes 116 that allow the free flow of oil in the riser under normal conditions. In an emergency, balls 114 are pushed into the oil stream below the Baffle Plate 108. The released balls 114A are swept upward to plug the holes 116 in the Baffle plate 108 to stop the flow of oil. The basic operation of the Ball Baffle BOP is just that simple.

The Ball Baffle Scheme was tried in Deep Water Horizon:

In fact, the "plugging the hole" scheme used in the Ball Baffle BOP of FIGURE 1 was the first thing that BP attempted to do to stop the flow from Deep Water Horizon. They called it the "Junk Shot." They inserted rubber-like material (reportedly even pieces of tennis shoes) into the well casing below where they believed the BOP had partially crushed the casing leaving a small orifice (opening) for oil to escape past the BOP closure. They hoped that the "Junk" material would plug the remaining opening and stop the flow of oil. Unfortunately, they did not understand why this would not work in their case. (I had learned why in 1996 during testing of the Downhole Adjustable Bent Sub that I designed and licensed to Sperry Sun/Haliburton, patents 5,445,230 and 5,673,765, http://wattenburg.us/directionaldrilling.html).

The "Junk Shot" failed because the orifice (the opening) in the partially crushed casing could not be completely plugged with the "junk" material they inserted to plug a jagged opening. They evidently did not realize that even the slightest bypass hole is rapidly eroded out to a bigger hole by the high velocity flow of oil that contains particulate material that grinds away any material partially plugging a small hole. This problem is avoided in the BBBOP by using round holes 116 (valve seats) in the Baffle Plate 108 that are tightly plugged by the balls 114A that are jammed into the holes under great fluid pressure in the riser. Thus, there is no erosion of the holes 116 due to leakage around the balls that plug the holes.

In **FIGURE 1** above, the side mechanisms 110 and 160 attached to the BBBOP housing 106 are examples of ball insertion apparatus. In the most basic form, both 110 and 160 can be replaced by a single control line to insert the balls 114 directly into port 120 with fluid pressure from top side when necessary. Or, an ROV can do this.

MAJOR FEATURES OF THE BALL BAFFLE BLOW OUT PREVENTER:

--- The Ball Baffle Blow Out Preventer (BBBOP) simply does the job of the emergency valve finally installed by BP on the broken Deep Water Horizon riser after great loss of time and enormous environmental damage. In contrast, the BBBOP "emergency valve" is designed to be in place – in the riser-- ahead of time and to operate immediately.

--- The BBBOP is also an additional measure of safety for the thousands of wells that have been plugged or capped with the standard Blow Out Preventer removed. The BBBOP is a $50,000 added measure of safety that can prevent another $30 Billion dollar Deep Water Horizon accident.

--- No large forces are required to activate the BBBOP. It was designed to be activated by a ROV (very quickly) if the automated mechanisms fail, as happened at Deep Water Horizon.

--- The BBBOP requires no underwater power source such as batteries or hydraulic storage tanks that can fail as in Deep Water Horizon. The BBBOP can be activated by a small control line to the surface and/or by a Remotely Operated Vehicle (ROV) working at depth. Or, the BBBOP can be set to activate automatically after a sudden pressure drop in the riser. In **FIGURE 1**, the ball insertion apparatus **110** is connected to a control line **142** that can supply fluid pressure from topside to force balls **114** into the oil flow beneath the baffle plate **108**. Or, an ROV can supply fluid pressure into port **134B**. The alternate apparatus 112 is a stand-alone mechanism that automatically inserts balls 114 into the oil flow whenever there is a predetermined drop in fluid pressure in the casing 100 compared to the external water pressure P300. The pressure drop threshold can be adjusted as appropriate. The balls 114 are kept inside apparatus 119 and apparatus 112 by doors 166 and 120 until the doors are forced open to activate the BBBOP.

---The Ball Baffle Shut Off Valve is Easily Reversed. Unlike the standard Blow Out Preventers in use today, the BBBOP does not damage the well casing. The shut off process is easily reversible, as described below.

--- Drawing A at the end of this report, a sketch, shows one place where the BBBOP can be inserted in the riser above the standard Blow Out Preventer Stack. **The BBBOP housing 106 is small.** It is about twice the diameter of the riser in which it is inserted. The enlarged part of the housing **106** that contains he Baffle Plate **108** is about 30 inches high. The housing **106** can be a cast or welded steel enclosure like the sections in the standard Blow Out Preventer Stack.

--- Swivel chair engineers will complain that the BBBOP does not allow a drill string or production casing to pass a BBBOP inserted in the riser. However, alternate versions of the BBBOP have been designed that allow a drill string or production tubing to pass by the Ball Baffle 108. In these versions of the

BBBOP, the Baffle Plate 108 swings down and out of the way to allow passage of a drill string or production tubing. (Nevertheless, the comfortable "oil well experts" will demonstrate their ignorance with ten reasons why the BBBOP of FIGURE 1 can't work -- before they try a basic experiment. Remember, they are the ones who told you that Deep Water Horizon could not happen. See an **"Out of the Box Solution"** described below that was published in the top scientific journal **SCIENCE.** It is a simple engineering solution to a major problem that the "engineering experts:" said could not be done.)

REVERSING THE BBBOP VALVE:

Unlike the standard Blow Out Preventers in use today, the BBBOP does not damage the well casing. The shut off process is easily reversible, as described below. The common Blow Out Preventers stop the flow of liquids during an emergency by crushing the well casing in a manner that is like permanently kinking a water hose to stop the flow of water. **However, the well is totally disabled until the crushed casing can be replaced.**

In contrast, the Ball Baffle BOP is an easily operated valve that can shut off the flow of oil/gas in a non-destructive, reversible manner. There is no damage to the well casing in which the BBBOP is mounted. To reopen the well, the balls 114A are simply pushed out of the holes 116 by mud fluid pressure from top side and purged out port 192 to allow oil to once again flow through Baffle 108. A conduit is attached to the exhaust port 192 in FIGURE 1 to carry the balls 114A to top side as they are suspended in oil exhausted out of port 192.

A copy of the U.S. Patent 8042615 (2011) for the Ball Baffle Blow Out Preventer (BBBOP) is posted along with this report at www.wattenburg.us The full patent figures show alternate forms of the BBBOP that implement the reversing process.

OUT OF THE BOX SOLUTIONS SOMETIMES WORK

The Ball Baffle BOP is an "out of the box" solution to a major problem that oil industry "engineering experts" will not consider because they seldom do anything that has not already been done or used by their colleagues in the field (or costs less than a million dollars). A good example of this professional arrogance is shown in a very readable paper in the world's top scientific journal ***Science, 14 April 1995, page 279.*** In 1995, the top freeway bridge designers of the world said that there was no way to build a modular four-lane freeway bridge that could be constructed on site any quicker than the several months required to rebuild their standard concrete and steel bridges after an earthquake. A great scientist, Dr. Daniel Koshland, motivated me to prove them wrong. I designed a modular freeway bridge that uses surplus railroad flatcar decks like Lego Blocks to construct a four-lane, 7 meter high, 16 meter long four- lane bridge that can be assembled on site in

two to three days -- with nothing more than a cutting torch and a 15-ton crane. The famous freeway designer and chief engineer of the California Department of Transportation, James Roberts, immediately ordered a state contractor to build a prototype while other "expert bridge designers" sneered on the sidelines. They were standing in awe five days later. Six months later, the California Department of Transportation used this bridge after a flood in 1996 destroyed twin bridges on I-5, the major north-south freeway on the west coast. They put up the flatcar bridge in one week's time and opened the bridge to full flow traffic (http://wattenburg.us/flatcar-bridge.html). The flatcar freeway bridge design is now used all over the world by third world countries that can't afford the "Cadillac" concrete and steel designs that cost ten times more and are completely destroyed if they are ever broken by an earthquake or dislodged by a flood. (As Dr. Koshland predicted, the "professional freeway bridge engineers" never mentioned this modular bridge in their "professional" journals.)

DISCUSSION:

What are you going to do if some event (or sabotage) destroys the riser pipe and all control lines to your underwater well? Has the industry provided you with anything more than a replacement Titanic to prevent the next Deep Water Horizon? **Deep Water Horizon should have told you that anything built by man will eventually fail. The only protection is a backup.**

Over confident "engineering experts" fade away after an accident occurs that they were sure could not happen. The CEO's must take the blame and pay the billion dollar bills. All that is proposed herein is that there are some simple and relatively inexpensive experiments and tests with the BBBOP (like $200,000 at most) that could prevent the next $30 billion Deep Water Horizon. Any deep water drilling is spending more every day than is required to utilize the added measure of safety that the BBBOP provides.

Can you afford to overlook a potential added measure of safety, an additional, small, Blow Out Preventer (Shut Off Valve), inserted in the riser above the Blow Out Preventer Stacks. It costs 5% of what you are paying for the present Blow Out Preventer Stacks? And this inexpensive shut off valve can also protect the thousands of abandoned and "plugged" wells that could become "unplugged" someday.

There will be more failures of existing equipment. My concern is that a major oil spill on the North Slope will stop all exploration in the Artic for decades at least. The U.S needs this resource in the future.

Are you confident that all blow outs and spills can be prevented by the safety equipment that you are using now? Most likely, your comfortable engineers will give you ten reasons why the BBBOP can not work -- before they try a simple experiment to discover their ignorance.

The major oil company "engineering experts" (and the new BSEE agency) dismissed the use of the simple Ball Baffle Blow Out Preventer (BBBOP) described herein when it was presented to them in 2011-2013. They were aware that I had designed one of the first downhole directional tools (bent subs) that could be adjusted from the wellhead without tripping the string in 1995-96. Many of the "oil well experts" at the time said that it could not be done -- until it was rubbed in their faces. The patents were licensed by Sperry Sun/Halibuton. Read the history at http://wattenburg.us/directionaldrilling.html).

Keep in mind that these are the "engineering experts" who were confident that their standard million-dollar Blow Out Preventer equipment would prevent a Deep Water Horizon accident. Then, when the disastrous Deep Water Horizon blow out occurred, they collectively stood on the sidelines and demonstrated their ignorance of the basic high-school physics principles that said that their first three attempts to stop the flow of oil would fail (**reference 1 below**). As a result, oil contaminated the Gulf region for a month before BP, at enormous expense, finally installed a shut off valve on the broken riser just above the million-dollar BOP that failed. This was a shut off valve that did nothing more than the **Ball Baffle BOP** can accomplish.

The BBBOP described herein is installed in the riser in the same place as the BP emergency valve finally installed at Deep Water Horizon -- and it does the same job quickly. Properly installed, the BBBOP can automatically shut down a runaway well in a few minute's time after the riser is broken or damaged -- or a few hour's time under the worst conditions if a ROV must be sent down to activate the BBBOP.

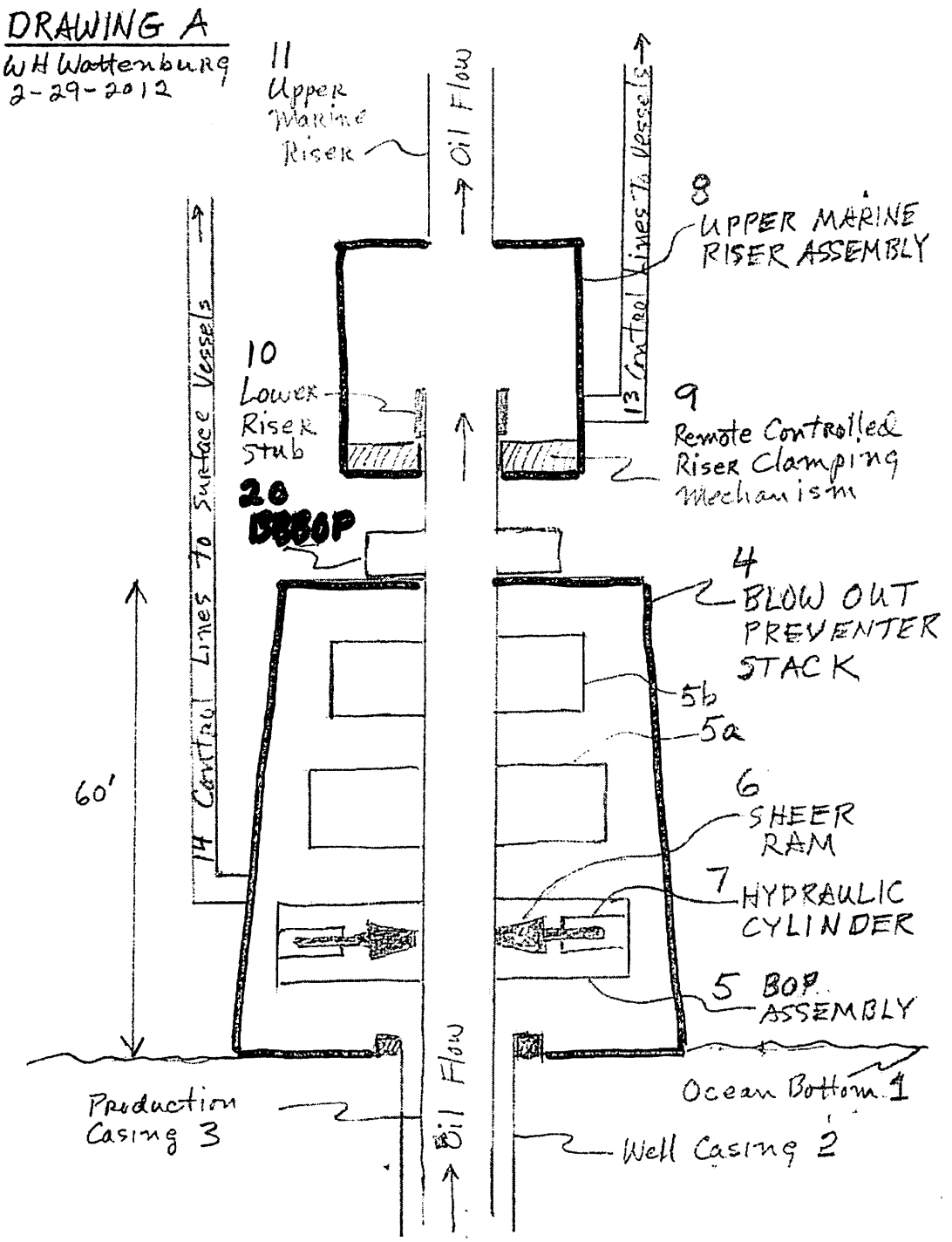
A couple of competent, motivated design engineers working in a machine shop in Houston or Anchorage can build the Ball Baffle Blow Out Preventer in two month's time.

Finally, almost every "out of the box" solution I have invented has been improved or replaced by better designs by good engineers and scientists once they were shown the way out of the box -- that other solutions are possible. That can be the big payoff for your drilling company if you open the door to the box and challenge your engineers to try something new.

Reference 1:

Basic high-school physics predicted the failure of the first three attempts to stop the oil flow from Deep Water Horizon in 2010: a) The "Junk Shot." b) The hood

placed over the broken riser that froze up with ice because of gas expanding inside. And, c) The attempt to cut the broken riser with a saw mounted on a ROV were the saw blade was trapped because they did not support the loose end of the riser to prevent it from bending over and trapping the saw blade.



DRAWING A (2-29-12)

DRAWING A (2-29-12) above shows a typical **BLOW OUT PREVENTER STACK (BOP)** at the ocean bottom **1** where it is attached to an oil well casing **3** of a deep water well (however, this could be a ground level well). This assembly is typical of the BOP STACK that failed in the Deep Water Horizon Oil Well Spill of 2010. DRAWING A shows where the new **BALL BAFFLE BOP** assembly **20** could be attached to existing BOP STACKS all over the world today.

In DRAWING A, the massive BOP assembly **4** can weigh over a 100 tons and be 60 feet high. (The BOP assembly **4** must be at least heavy enough to resist the hydraulic force of the oil coming up the production casing **3**.)

Several sheer ram assemblies 5, 5a, 5b, etc, are inside the BOP Stack 4. Sheer Ram Assembly 6 uses hydraulic cylinders 7 to force the Sheer Ram 6 against the production casing 3 and stop oil/gas flow by crushing the casing 3. **Note that substantial energy must be stored in the BOP STACK 4 and/or supplied by conduits from the ocean surface in order to activate the sheer ram cylinders 7.** BOP STACK **4** typically contains electrical batteries that power electrical motors that in turn generate hydraulic pressure to operate the hydraulic cylinders 6.

Upper Riser **11** carries the product (oil and/or gas) to the ocean surface storage vessels. (Riser **11** can be 5000 feet or more long). Riser **11** is supported by a surface vessel. It has a device at its lower end that connects pipe **11** to the Lower Marine Riser **10** coming out of the BOP ASSEMBLY **4**. This is the **Upper Marine Riser Assembly 8**. It contains remote controlled mechanisms **9** that tightly clamp to the Lower Marine riser (pipe) **10** and connects pipes **10** and **11** to channel the flow of product to the surface ships or storage vessels.

The **Upper Marine Riser Assembly 8** is designed to allow surface ships to disconnect from the Lower Marine Riser 10 and shut off the flow of oil from the Lower Riser **10**. The surface ships must drag the long Upper Riser pipe **11** with them when the surface ships leave their stations because of bad weather or for other reasons. (Note that there must be a remote controlled flow shut-off valve somewhere in the Upper Marine Riser **8** or below it to stop the flow of oil when the Upper Marine Riser is detached and carried away. These details are not shown in DRAWING A.)

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(i2> **United States Patent** (io>Patent NO.: **us8,042,615 Bi**

(54) BLOW OUT PROTEC TOR VALVE EMPLOYING BALL BAFFLE ASSEMBLY FOR USE WITH HIGH-PRESSURE FLUIDS

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(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

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(22) Filed: Sep. 9,2010

(51) IntCl.
E21B 33/13 (2006.01)
(52)..... U.S.C1 166/373; 166/85.4; 166/75.15
(58) Field of Classification Search ..... 166/373, 166/85.4, 75.15, 84.3,318 See application file for complete search history.

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(57) ABSTRACT

A Ball Baffle Blowout Preventer (BBBOP) (102) or shut-off valve generally comprises a housing (106) and a baffle (108) - secured -within the housing-and containing a plurality-of holes. The housing is mounted in the path of the well pipe but the holes in the baffle allow normal production fluid to pass. One or more ball dispensing mechanisms (BDM) (110,112) are connected to the housing. Each BDM contains a plurality of balls (114) and one or more valves (196). When a blowout condition occurs, a plurality of balls (114) are released beneath baffle (108) and are carried upward by the upwardly gushing lluid to plug the holes. The balls (114) are held in place by the pressure differential below and above the baffle. The balls can be removed from the baffle by the forcing fluid down the well. All operations can be controlled undersea by remotely operated vehicles (ROVs). A plurality of BBBOPs can be stacked and each can be set to operate at a different pressure and flow rates. The BBBOP may also include a Threshold Pressure Detection Unit for actuating the BDM that requires no electro-mechanical components; it uses only the energy of pressurized fluids in a well bore. The manual and self-actuating BDMs are not disabled by slow leaks of ambient well pressures past the hydraulic seals used therein. In another embodiment an additional baffle (250) can be provided below the first baffle (108) to contain the balls after they are released from the first baffle.

21 Claims, 6 Drawing Sheets