

Hibmann

Hydrogen Production - Louisiana, Mo.

For the production of 100,000 cubic feet per hour of hydrogen with 23,000 cubic feet of oxygen the following methods may be used:

1. Winkler - generator.
2. Koppers generator for pulverized fuels.
3. Gasification under pressure LURGI.
4. Gasification of lumps in a rotating grate producer.
5. Combined carbonization and gasification in a LURGI carbonizer.

The Winkler generator is a special device for gasifying lignite char. Its normal capacity is far beyond the requirements of the Louisiana plant. Construction of a small unit seems not feasible when this method is used as the velocity of the gas and the reaction time would require long thin reaction chambers of high cost and a low heat efficiency. The Winkler process is not feasible for gasifying bituminous coal.

The Koppers generator can be used for any coal which can be pulverized with a reasonable cost. For the Louisiana plant a small unit with approximately 1/8 of an industrial unit must be developed. The investment for this unit may be relatively high but the Koppers method is very interesting for the utilization of bituminous coals. By-products are not recovered.

Pressure gasification could be used with a normal industrial unit, but bituminous coals which are mostly coking cannot be gasified directly. Pressure gasification is more advantageous than other methods for the production of city gas from non-coking fuels and for the gasification of high volatile coals and lignites with air and oxygen for the production of power gas (gasturbine) and synthesis gas.

Rotating grate generator (A.B.C. grate). This method of gasification under atmospheric pressure with oxygen is most suitable for the gasification of small size coke for hydrogen production. ~~It is the cheapest investment and probably the cheapest production method for Louisiana.~~ (Used in X.G.-Auschwitz plant in connection with LURGI carbonizers for bituminous coal).

J.G.

LURGI Carbonizer Gas Producer. A two cell unit can be used. All non-caking and some moderately caking coals can be gasified even with 38% moisture with a high yield of by-products. The distillation gas can be used as heating gas or cracked to hydrogen. This method is very advantageous for the production of gas and power from highly bituminous non-caking coals in connection with synthesis and hydrogenation.

The following viewpoints may be considered with relation to the special advantages of the various methods:

<u>Viewpoints</u>	<u>Preferred Method</u>
1. Low in investment and production cost of full quantity reliable operation.	A.B.C. Generator
2. Interest in utilization of caking bituminous coals.	Koppers Generator
3. Interest in by-prod. gasification and carboniz. utilization of non-caking and sub-bituminous coal.	LURGI Carbonizer Gas Producer
4. Interest in production of city gas and power gas with by-products.	Pressure Gasification

Details for the necessary equipment and the material and energy required for operation are shown on attached sheets.

Dr. Otto Hubmann

(1/27/47)

Methods of Gasification with Oxygen

Oxygen available: 23,000 cu.ft.per hr. Gas required: 100,000 cu.ft.per hr.

Method	H ₂ + CO Prod.P.U. C.F./Hr.	Oxygen Consum. C.F./Hr.	Max.Prod. w/avail. O ₂ C.F./Hr.	Gener. Fuel	H ₂ :CO Ratio	Required per 100,000 C.F./Hr.				
						F/Gener. Steam Lbs.	KWH	F/Compr. Steam Lbs.	W.W.Shift reas Cooling W. Gal.	KWH
Winkler Gener.	550,000	165,000	77,000	Lignite subb. coal char or dried 1/8 - 1"	1.4:1.0	from waste-heat		7,000 20 ata	65,000	1050
Koppers Gener.	700,000	189,000	85,000	Pulveriz. coal of all kinds	1.0:1.5 1.0:1.0	from waste-heat		8,000	70,000	1000
Pressure Gasif.	170,000	43,000 (27,000) C.Y.Gas	91,000 (145,000)	Non-cak- ing coals to 30% moist. anthr.coke 1/8 - 1" 3/4 - 2"	1.2:1.0 1.8:1.0		3,300 25 ata	150*	6,000 20 ata	65,000 250
A.B.C. Producer	105,000	23,200	104,000	Anthr. coke, char 1/4 - 2"	1.5:1.0		4,000 2.5 ata	50	7,500 20 ata	65,000 1050
LURGI Carbon. Gener.	150,000 (600,000)	33,000	104,000	All non- caking coals & lignite 1/4 - 1-1/2" 1 - 2-1/2"	1.2:1.0 1.5:1.0		3,000 25 ata	50	7,500 20 ata	85,000 1050

* - Compr. of O₂ Incl.

Oxygen production requires 400 KW and 20,000 to 25,000 gallons per hour cooling water.

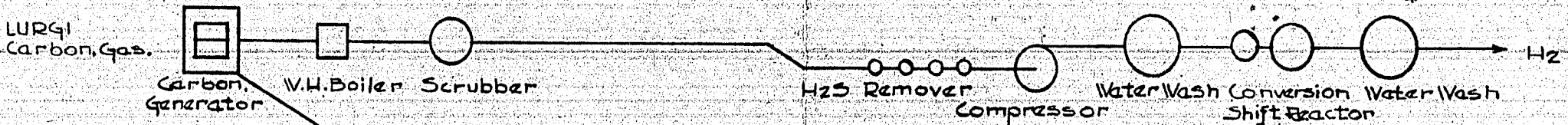
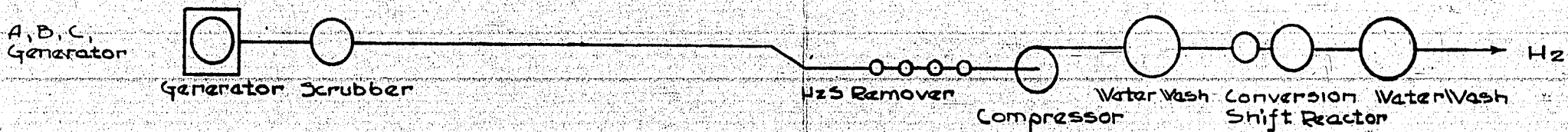
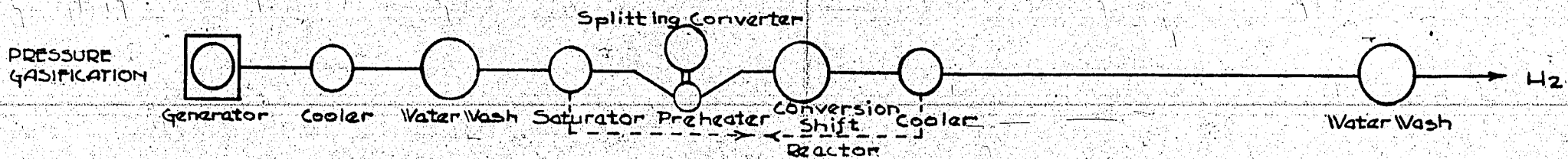
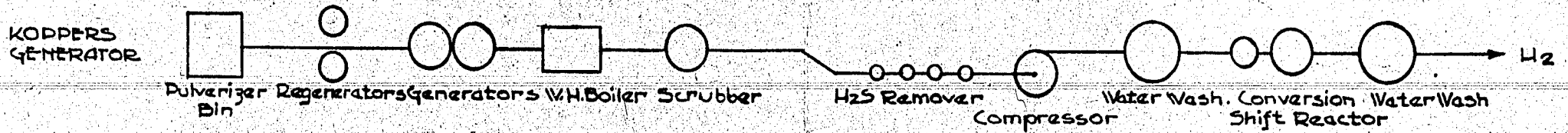
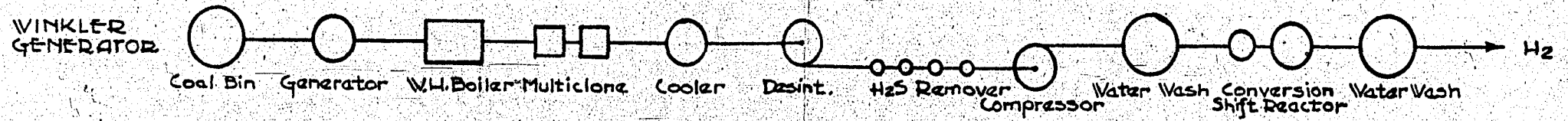
New drawings had to be made. Only 77% of the gas can be produced.

Only 85% of the gas can be produced. Efficiency, gas quality and production per cubic foot of O₂ might be considerably lower with only 1/8 of a normal size unit.

A normal 91,000 cubic feet of gas can be produced.

Lowest investment cost, all the gas can be made, but only from anthracite, char and coke.

A two-section LURGI carbonizer is suitable. All non-caking coals up to 38% moisture can be gasified. By-products are recovered and some additional heating gas.



DRWN.	HM	REV.		BUREAU OF MINES, LOUISIANA, MO	ENGINEERING
DATE	1-28-47	BY		COAL HYDRO. DEMON. PLANT DIV.	DESIGN
APPR.		APP.		EQUIPMENT REQUIRED	SHEET
DATE				FOR HYDROGEN PRODUCTION	NO. 127