

IV.

ETHYL GASOLINE CORPORATION

CHRYSLER BUILDING
405 LEXINGTON AVENUE

NEW YORK

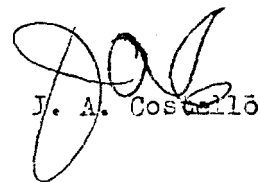
INTER-OFFICE
CORRESPONDENCE

December 5, 1941

MEMO TO MR. H. W. KALEY

Attached is a report which Ellis Locher prepared covering the work which he did in cooperation with the Schutte & Koerting Company on the operation of an eductor used for tank cleaning.

Ellis advises that he still has two of these eductors at home, and he has Schutte & Koerting's permission to keep these as long as we continue to make experiments with them.


J. A. Costello

JAC:k
Att.

KE 0022408

N22501

TANK CLEANING EDUCTOR

The following is a brief description of certain equipment which appears could be used for the cleaning of small storage tanks-- that is to say, the typical type tanks found in bulk plants, either vertical or horizontal. These tanks usually have a maximum dimension of $10\frac{1}{2}$ feet by 30 feet and capacities in the neighborhood of 20,000 gallons or less. The purpose of using this equipment is to enable a tank cleaning job to be done without the necessity of men entering tanks.

EQUIPMENT

Equipment consists primarily of a water actuated, specially designed, eductor. The one used for experimental purposes is manufactured by the Schutte-Koerting Special 2" Eductor (Brass) (Water Jet Cesspool Pump - Fig. 222). Water under pressure is introduced in the inlet side of the eductor. A hose connected to the suction side of the eductor is placed in the tank and the combined discharge would again go through a length of hose to a pit.

OPERATING CHARACTERISTICS

In practise a working pressure at the inlet side of the eductor at $40\frac{1}{2}$ lb./sq. in., and a maximum flow of 23 GPM has given satisfactory results. However, as this pressure increases up to a certain point the suction capacity increases at a much higher rate. For the purpose of this equipment the suction capacity may be defined as the quantity of material removed from the tank and for convenience measured in gallons per minute.

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Curve Sheet I shows the relationship between Pressure Capacity, or the quantity of water entering the eductor, and Suction Capacity plotted against Working Pressure. These curves were plotted for water only, but the manufacturer of the eductor uses as a rule of thumb to measure the solid material handling capacity of the eductor, 4 pounds of sand per gallon of water. No accurate tests have been made to measure the rate at which solids can be removed. From crude tests which I have run, it is apparent that there is little advantage in operating the eductor at pressures above 60 pounds per square inch, although if pressures in excess of this amount were available throttling is not necessary.

Curve Sheet II shows the Suction in Inches of Mercury as well as the computed Suction Lift in Feet, plotted against operating pressures at the eductor. This curve will indicate the height at which material can be lifted under various working pressures and it is significant to note that the equipment would be applicable to the usual type of underground horizontal storage tank.

MISCELLANEOUS NOTES ON REQUIREMENTS FOR OPERATION

Water Pressure From a preliminary check, it is evident that most bulk plants have a municipal supply of water available, with a main in excess of 2" and an outlet no smaller than 3/4". Pressure is usually in excess of 30#/sq. in.

Pump A pump is recommended as part of the equipment, to be placed in the line between the water connection and the eductor, to boost pressure as required. Even though a minimum pressure is available without the pump, its use, by boosting pressure, will increase Suction Capacity and decrease Time required to do job.

Hose 2" hose has been selected in order to keep to a minimum the pressure drop due to friction losses.

Guage The manufacturer of the eductor will make a guage having a nozzle the duplicate of that in the Eductor. With a pressure guage attached, working pressure at any point can be determined in advance.

EQUIPMENT AND APPROXIMATE COST

1 - Schutte-Koerting Special 2" Eductor (Brass) (Water Jet Cesspool Pump - Fig. 222).	\$ 69.00
1 - Motor Pump - Centrifugal Type - 25 GPM - 65 Ft. Head 1 HP Explosion Proof Motor	100.00
200 Ft. 2" Smooth lined non-kinking hose, suitable for pressure or vacuum	170.00
Miscellaneous valves, fittings, gages, probe, nozzles, etc.	<u>100.00</u> \$439.00
<u>Round figure cost</u>	<u>\$450.00</u>

SUMMARY

1. Experience has shown that the fundamental principle described is applicable to tank cleaning. So far no tanks have been cleaned on this basis, primarily because the equipment necessary was not available at the time of an actual tank cleaning. In spite of this, material heavier than normal sludge, and of approximately the same consistency, has been successfully removed from an underground tank.
2. There is need for further experimental work to refine equipment.
3. The probe and tools designed and developed by Jim Boudreau would be used to advantage on the suction side of the eductor.
4. There is need of an accurate survey of operating conditions at various representative bulk plants in order to determine the limitations

of the use of the equipment of this type. (A rough estimate indicates that more than 75% of bulk plants have suitable conditions). I would recommend that a complete set of equipment be assembled for use and then made available to various oil companies for use under actual tank cleaning conditions.

5. It is significant to note that the Shell Oil Company has for a number of years been using a completely equipped truck for the cleaning of underground service station tanks and fuel oil tanks. The equipment they use is somewhat similar to that described in this report. That is to say, the principle used for removing material is an eductor. In this connection they have offered their cooperation which insures the loan of one of their trucks for any experimental work which we may wish to do.

IV

WATER JET CESSPOOL PUMPS

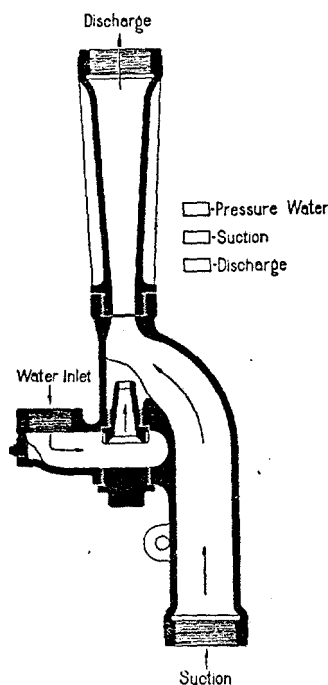


FIG 222

THE $\frac{1}{2}$ Water Jet Evacuator or Cesspool Pump, Fig. 222, is used to handle liquids containing solid matter. The arrangement of suction and discharge connections allows passage of this solid matter through the pump. Water under pressure is used as the operating medium and the entrainment action of the jet of pressure water draws in the liquid to be pumped.

The $\frac{1}{2}$ Water Jet Evacuator has no moving parts and little attention is required, as the operation can be closely regulated by a single valve in the pressure water line. These jet pumps are better suited for cesspool cleaning or similar service than pumps of other types. Where there is a large amount of solid matter in the liquid to be handled, a mushroom strainer should be used on Evacuator suction line.

CAPACITIES AND PRICES OF $\frac{1}{2}$ WATER JET CESSPOOL PUMPS, FIG. 222

Size	Suction Capacity Gals. Per Hour	Connections, Inches		List Price		Code Word	
		Pressure Water	Suction and Discharge	Brass	Iron	Brass	Iron
1½	720	¾	1½	\$52.00	\$46.00	Cyanic	Cycloid
2	1,350	1	2	69.00	58.00	Cyclic	Cyclometer
3	3,600	1½	3	104.00	81.00	Cycling	Cyclonal
4	6,600	2	4	173.00	104.00	Cyclist	Cyclone

⌘ WATER JET SAND AND MUD EDUCTORS

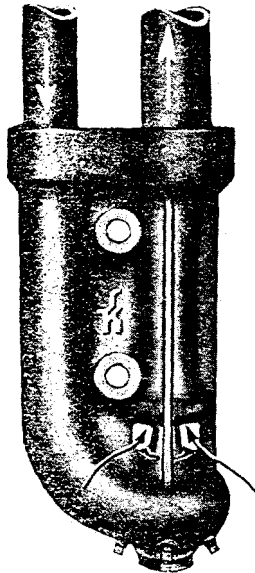


FIG. 224

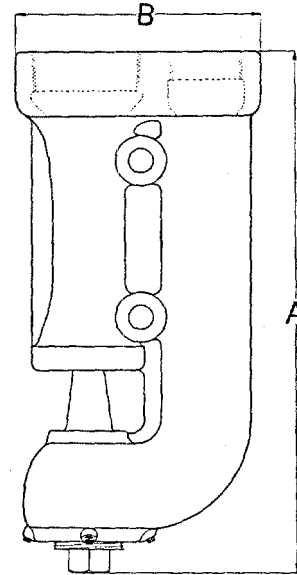


FIG. 224

⌘ SAND AND MUD EDUCTORS are recommended for pumping out wells, pits, etc., where there is an accumulation of sand, mud, slime, or other material of a nature not easily handled by the standard Water Jet Eductors.

Mud Eductors are likewise well suited to handle the heavy sludges forming the residue from refining operations in oil plants or from other industrial processes.

CAPACITIES, PRICES AND DIMENSIONS OF ⌘ WATER JET SAND AND MUD EDUCTORS, FIG. 224

Size	Suction Capacity Gals. Per Hour	Connections, Inches		List Price	Code Word	Weight Lbs.	Dimensions (Inches)	
		Pressure Water	Discharge				A	B
1½	750	1	1½	\$58.00	Cystic	10	9⅜	4⅜
2½	2,600	2	2½	69.00	Cystose	35	16¾	7⅞
3	4,000	2½	3	95.00	Cytode	75	16¾	7⅞
4	7,000	3	4	160.00	Cyv	120	25½	11
*5	11,000	4	5	250.00	Cyvas	200	30½	17⅜
*6	15,500	5	6	360.00	Cyvor	300	39¼	19⅜

* Have flanged ends.

⌘ Sand and Mud Eductors are usually made in cast iron with bronze pressure nozzles. For handling pickling solutions and other corro-

sive liquids, they can be made of Everdur or of other suitable metals.

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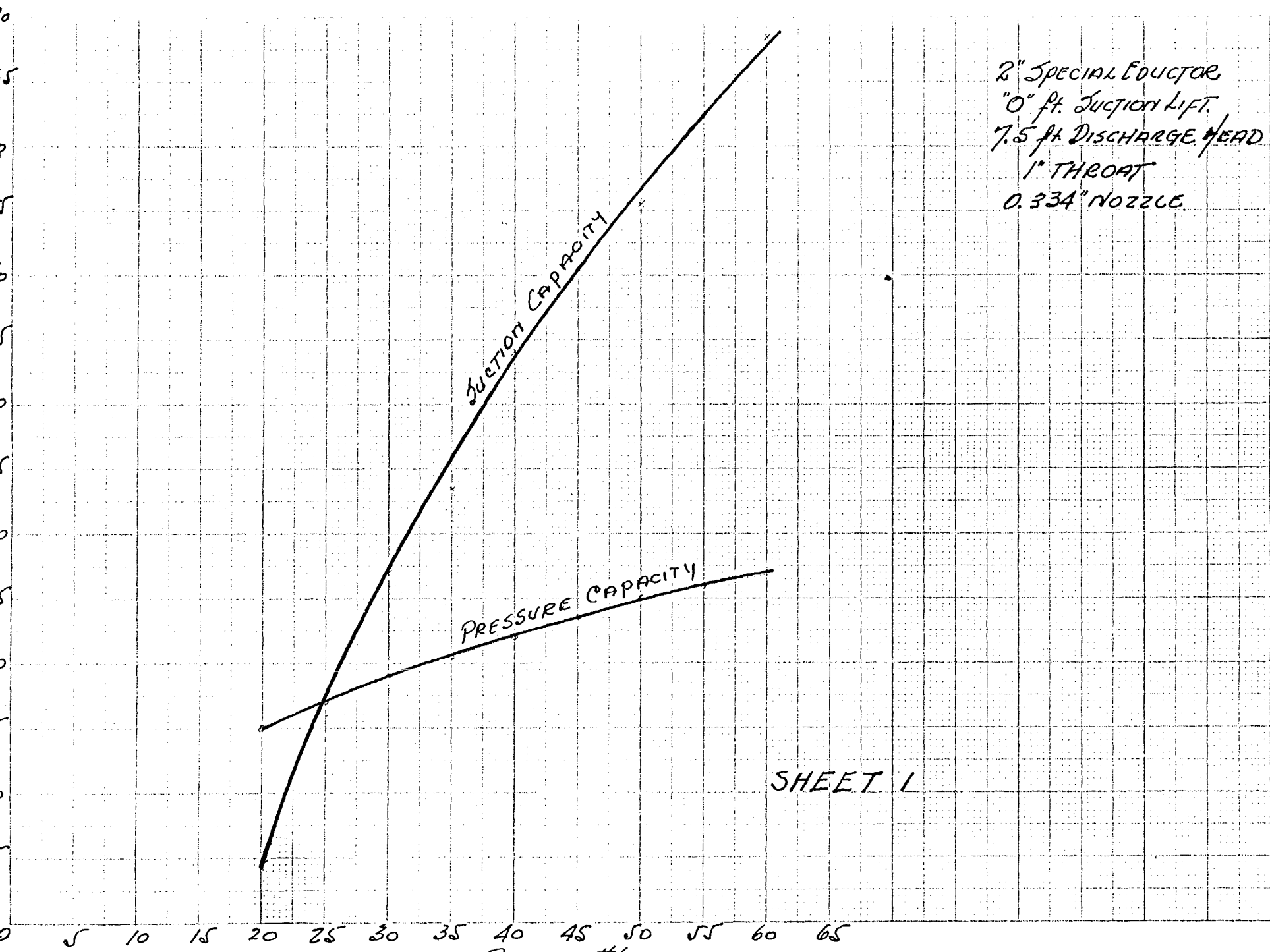
Suction Capacity

Pressure Capacity

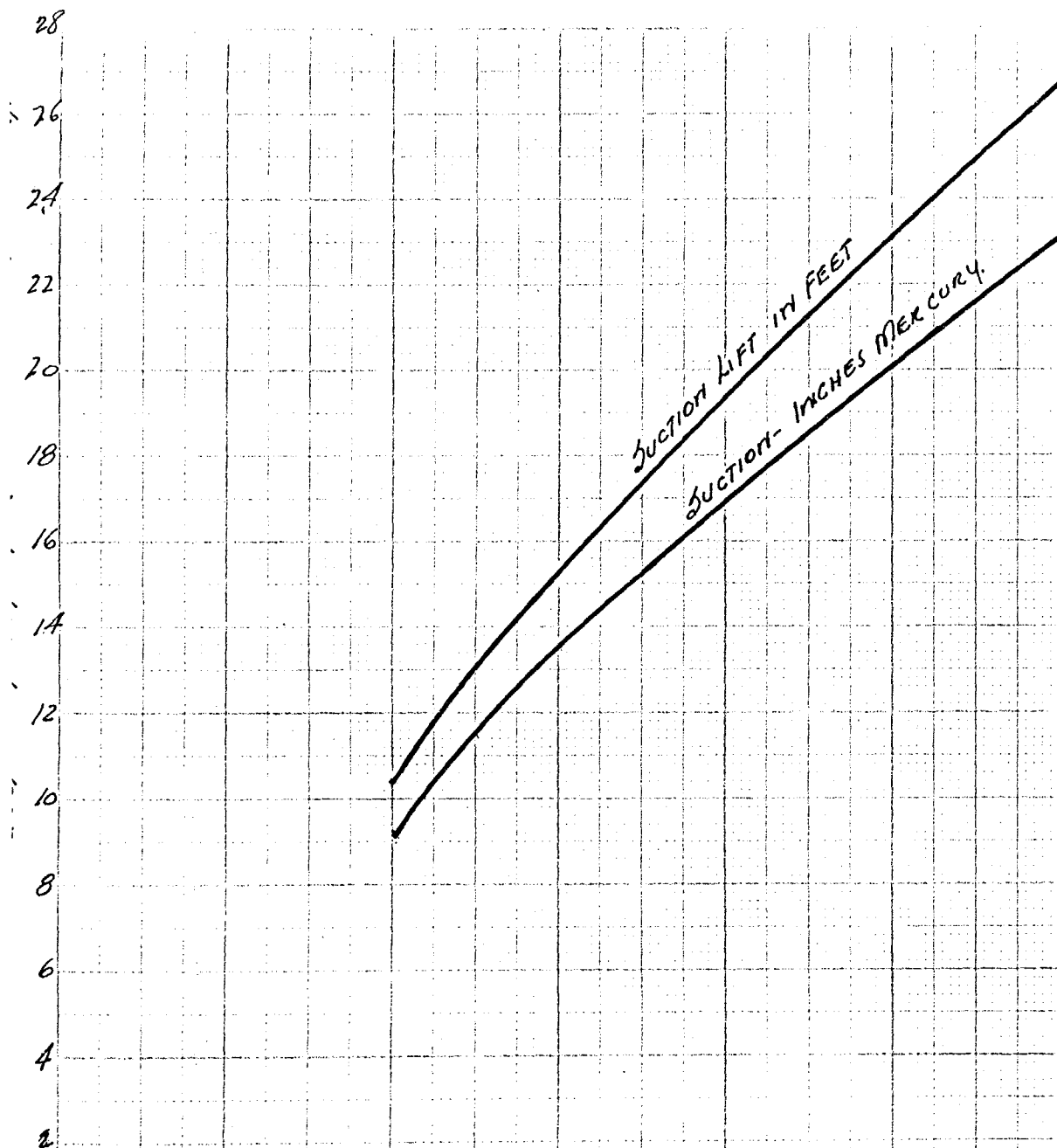
2" SPECIAL EJECTOR
"0" ft. Suction Lift.
7.5 ft. Discharge Head
1" THROAT
0.334" NOZZLE

SHEET 1

Pressure Capacity in Gal/min.



REF 0022417



2'
0"
1"
0.3

SHEET 2