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INFORMATION REPORT INFORMATION REPORT

CENTRAL INTELLIGENCE AGENCY

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S-E-C-R-E-T

COUNTRY USSR (Tula Oblast)

REPORT

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SUBJECT Production Difficulties at the Soviet-Built Urea Plant at Shchekino Chemical Combine

DATE DISTR. 3 April 1964

NO. PAGES 2

REFERENCES

TE (Soviet requests to Dutch in solving problems have met with little enthusiasm)

DATE OF INFO.

PLACE & DATE ACQ.

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THIS IS UNEVALUATED INFORMATION. SOURCE GRADINGS ARE DEFINITIVE. APPRAISAL OF CONTENT IS TENTATIVE.

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1. A six-page translation of a report on production difficulties encountered at the Soviet-built urea plant at Shchekino, near Tula Nine sketches, including a diagram of the Shchekino chemical combine and several process diagrams, are included with the report.

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2. The Soviet plant, built after the American CHEMICO process, is calculated to produce 400 tons of urea per day; so far no eight-hour prills have been made but technical grade crystalline urea has been produced.[1,2] Of the four units set up within the plant, two do not operate at all, one operates off and on and one operates constantly; however, production at the neighboring Dutch-built urea plant was adversely affected whenever the second unit at the Soviet plant was put into operation.

3. Soviet requests for help from the Dutch in solving these problems have met with little enthusiasm or success. Soviet design engineers are now studying the Dutch-built plant in detail; presumably the Soviets intend to alter their plant themselves according to the Dutch process.

Comments:

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1. construction of a small urea plant by the Soviets themselves at the Shchekino Chemical Combine was begun in mid-1961. It was planned that the plant would begin production on 1 January 1963 and that production would be 50 to 75 tons per day.

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GROUP 1
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2. [redacted] the Soviet urea plant at Shchekino began production on 11 February 1963. It was producing technical urea at 15 percent of its full capacity of 140 tons per day. The process used was of Japanese origin.

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Distribution of Attachment:

[redacted]
ORR - Retention (1 copy w/o sketches) (transmitted direct)
[redacted]
OSI - Retention

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[redacted]

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Country: USSR

Subject: Production Difficulties at Soviet Urea Plant at Shchekino Chemical Combine

28 February 1961

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Date of Info :

Attachment

Place and Date Acquired:

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1. The Soviet urea plant at the Shchekino chemical combine obviously was built after the American CHEMICO process. Czech compressors and reactors had been installed. The location of the plant and the estimated dimensions are given in attachments 1, 3 and 4. A key to these attachments is in para 11 below.

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2. the plant is calculated to produce 400 tons of urea per day. In the total no eight-hour prills had been made but technical grade crystalline urea had been produced.

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3. four units had been set up in the plant. two units were not at all in operation yet while one of the other units operated off and on and the remaining one operated constantly. Production in this last unit, however, also was experiencing difficulties. See attachment 2 for which the key is in para 11 below.

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4. this plant took CO_2 and NH_3 from the Soviet NH_3 synthesis but that this installation supplied too little CO_2 for both plants, since the production in the Dutch plant fell behind about 50 tons a day whenever the second unit in the Soviet plant was in operation. several times in the Dutch plant the production fell behind because of lack of CO_2 but the Soviets were expanding their NH_3 synthesis so that it can be expected to have sufficient CO_2 in the future.

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5. various problems encountered in the production in the Soviet urea plant The CO_2 com- /duction chief of the combine.

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pressor for the unit which is in constant operation worked well. The greatest difficulty in this unit lay in the recirculation section. The gas separation did not function well One result, however, was that because of the CO_2 and the formation of the by-product "MEA" corrosion appeared in the low pressure part of the recirculation section. 50X1-HUM 50X1-HUM 50X1-HUM

6. In the building for end processing difficulties first of all appeared in the crystallizing equipment. Again four installations had been set up but at the most two worked. Each installation was calculated to produce 25 tons of crystalline urea per day. The system looked a lot like the Dutch system and was probably a copy of it. a crystal propeller /screw/ in the propeller /screw/ there was a single blade. The Dutch installation has double blades (see attachments 7 and 8 - key para // below). this could be the cause of difficulties on this point. 50X1-HUM 50X1-HUM

7. To manufacture prills the concentrated urea solution is even more highly concentrated by vaporizing in a vacuum. The process has to be quick in order to avoid forming "biureet." There were four vaporizors in the plant for the end processing. They were hooked up together in twos. They were Luwa (Swiss) model, type 6, and probably copied from them. The plant manager had a Luwa instruction booklet. The vaporizors had been set up according to the instructions in it and were calculated to produce 100 tons per day apiece. To obtain the best end product the conditions were, according to the instructions: a pressure of 350 mm. of mercury, a temperature of 150°C, and the vaporizors six meters above the pumps. The Soviets had adhered strictly to these rules. these conditions in themselves make it impossible to form a good end product.[1] the following circumstances also are the cause of this installation's inability to produce any prill end product: 50X1-HUM 50X1-HUM 50X1-HUM

1. The flanges were only half attached to the vaporizors.
2. Underneath in the vaporizor water was added and it ran out again on the other side. The moisture content of the product was too high as a result and made it impossible to prill.
3. Two vaporizors were hooked up to one vacuum installation with vacuum pump and injector which is not feasible.
4. Underneath in the vaporizors no "false air" was injected which experience has shown to be a good method. 50X1-HUM
5. The swan necks in the lines to the pumps did not belong there and must operate to a disadvantage.
6. The connections at the pumps were faulty. These connections did not belong there and must cause leaks. The pumps were Rheinhütte model (the same as in the Dutch plant) and in themselves worked well.
7. The urea reservoir above the prill tower did not belong

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Attachment

there. It is incorrect to store the very highly concentrated urea solution in a reservoir above the prill tower since by staying there "biureet" is formed in the product. The urea must come to a low temperature as soon as possible and be brought directly from the pump via the prill cup in the prill tower. See attachments 4, 7, and 9 (key in para 11 below).

8. The prill cup was probably a copy of the Dutch model the way in which it was copied made it suitable for production of not more than 80 tons a day. At the plant were two prill towers each about 8 meters in diameter and about 35 meters tall.. two prill towers of these dimensions are indeed necessary for a total production of 400 tons a day. 2

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9. At the unit which was in operation the following workers were employed: four men at the compressor, three at the recirculation section, and eight at the crystallization installation. According to Dutch standards the numbers for the compressor and the recirculation section were not too large but for the crystallization installation there were four more men than necessary.

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10. there is possibility of improving the process in the Soviet urea plant without much drastic alteration. Although the Soviets have said they did not know where to look in studying the Dutch urea plant, four Soviet design engineers have been walking around continuously in the Dutch plant to copy the whole plant and to ask the Dutch personnel all kinds of questions. According to source, the Soviets certainly intend to alter their plant themselves according to the Dutch process.

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11. There follow below keys to the attachments:

Attachment 1: Diagram of Shchekino chemical combine and location of Soviet urea plant. Index:

1. Soviet urea plant: synthesis recirculation building (see attachment 5).
2. Soviet urea plant: absorption and desorption columns (see attachment 6).
3. Soviet urea plant: end-processing building and two prill towers (see attachment 7).
4. Compressor hall under construction
5. Office buildings.
6. Main entrance.
7. Cooling towers
8. NH_3 synthesis ???
9. Second entrance.
10. Guard house and guard.
11. Entry gate.
12. Closed off gate.
13. Wooden fence.
14. Compressor hall under construction

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Attachment

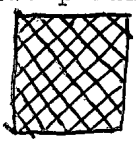
15. Air separation and compressor hall.
16. Graduated coolers.
17. Main building of Dutch urea plant.
18. Dutch urea plant and prill tower.
19. Formaline plant.
20. Planned expansion for Dutch urea plant.
21. Caprolactam plant.
22. Formaldehyde plant.
23. Outermost fence of Shchekino chemical combine.

Dimensions: a. ± 35 meters
b. ± 30 meters
c. ± 30 meters
d. ± 20 meters
Main building 1 = ± 25 meters
Main building 2 = ± 15 meters and prill towers ± 30 meters.

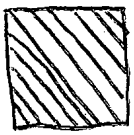
Roads

Attachment 2: Diagram of most important assembly and the difficulties in the Soviet urea plant. Index:

A. Building containing the synthesis-recirculation (point 1 of attachment 1).
B. End-processing building (point 3 of attachment 1).
1. Compressors (four units).
2. Recirculation apparatus (heater, separator, condenser) (four units).
3. Crystalization propellers [screws] (four units).
4. Vaporizors (four units).
5. Two prill towers.



Part of plant which does not work at all.



Part of plant which works occasionally.

Part of plant which operates but where there are a lot of difficulties.

Attachment 3: Cross section of synthesis-recirculation building and the absorption and desorption columns (see attachments 5 and 6). Index:

1. CO_2 compressors.
2. Synthesis control panel.
3. Coolers and separators.
4. Decomposition apparatus.
5. "HD" - NH_3 pump.
6. "HD" - water pump.
7. Urea synthesis column.
8. Absorption and desorption columns.
9. Steps.
10. Centrifugal pumps.

Estimated dimensions:

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Attachment

a - 12 meters
b - 5 meters
c - 2 meters
d - 1 meter
e - 5 meters
f - 5 meters
g - 7 meters
h - 25 meters
j - 15 meters

Attachment 4: Cross-section of the end-processing building and the prill tower (see attachment 7). Index:

1. Vaporization apparatus (heater, vaporizor, separator).
2. Crystalization.
3. Vaporization apparatus.
4. Luwa, model 6.
5. Pumps, Rheinhütte model.
6. Elevator.
7. Prill tower.

Estimated dimensions:
a - 18 meters
b - 7 meters
c - 10 meters
d - 5 meters
e - 15 meters
f - 5 meters
g - 8 meters
h - 30 meters
j - 5 meters
k - 1.5 meters

Attachment 5: Process diagram 1. Four units at 100 tons a day. Index:

1. CO_2 compressor (Czech).
2. Reactor (Czech) (200 atmospheres; 192° C).
3. Three plunger NH_3 pumps.
4. "HD" water pump (250 atmospheres; 1.8 cubic meters/h /per hour?/
5. First step of decomposition.
6. Second step of decomposition.
7. Carbamate condensor.
8. Urea stock tank.

Attachment 6: Process diagram 2. Index:

1. CO_2 absorption column.
2. CO_2 desorption column.
3. NH_3 compressor.

Attachment 7: Process diagram 3. Index:

1. Heater.
2. Vaporizor.
3. Carbamate condensor.
4. Crystallizing propellers /screws/ (capacity 25 tons a day).
5. Reservoir
6. Joining of second Luwa.
7. Luwa vaporizor, type 6.
8. Smelting pump (Rheinhütte model).
9. Stock tank.
10. Prill cup.

Attachment

11. Vaporization to about 92% urea solution.
12. Vaporization to about 99.8% urea solution
13. Prill tower.

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Attachment 8: Diagram of a crystal propeller [screw]. Index:

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1. Vaporizor.
2. Reservoir.
3. Crystal propellers [screws].
4. Single crystal propeller [screw] in Soviet urea plant.
5. Double crystal propeller [screw] according to Dutch process.
6. Propeller [screw] blades.

Attachment 9: Diagram of end processing in Soviet urea plant. Index:

1. Vaporizors, Luwa model, type 6.
2. Vacuum installation with vacuum pump and injector.
3. Stirring device.
4. Flanges.
5. Water supply.
6. Swan neck.
7. Distance of six meters.
8. Connections.
9. Pumps, Rheinhütte model.
10. Reservoir for highly concentrated urea solution.
11. Prill cup, Dutch model.
12. Prill tower.

Comments:

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1. In the Dutch process they use type 5 vaporizors figuring on a production of 200 tons a day under a pressure of 40-60 mm mercury and a temperature of 138°C with the vaporizors ten meters above the pumps. In practice this seems to be the most ideal conditions for a good end product.

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2. At the Dutch urea plant there is only one prill tower of larger dimensions and suited to produce 500-600 tons per day.

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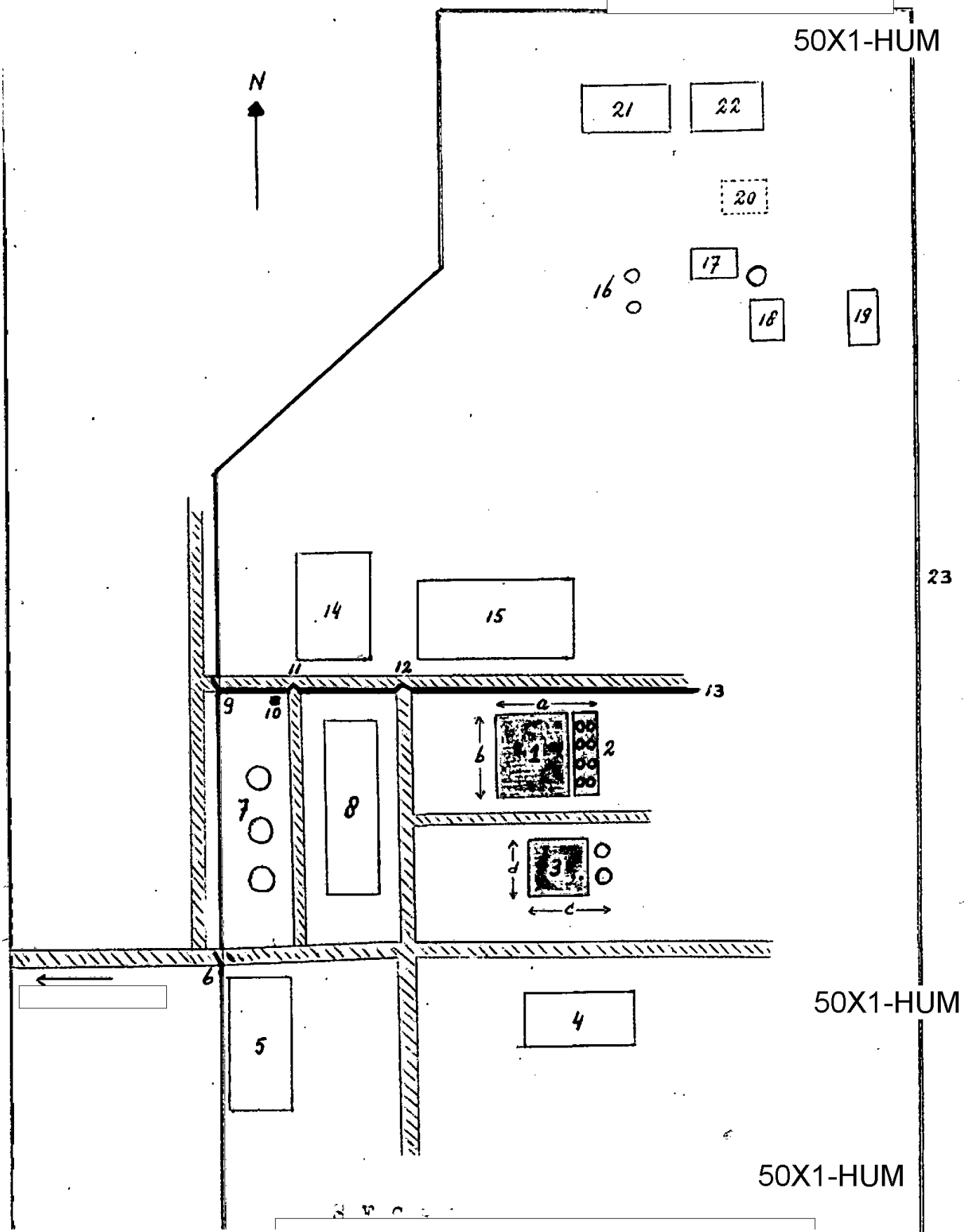

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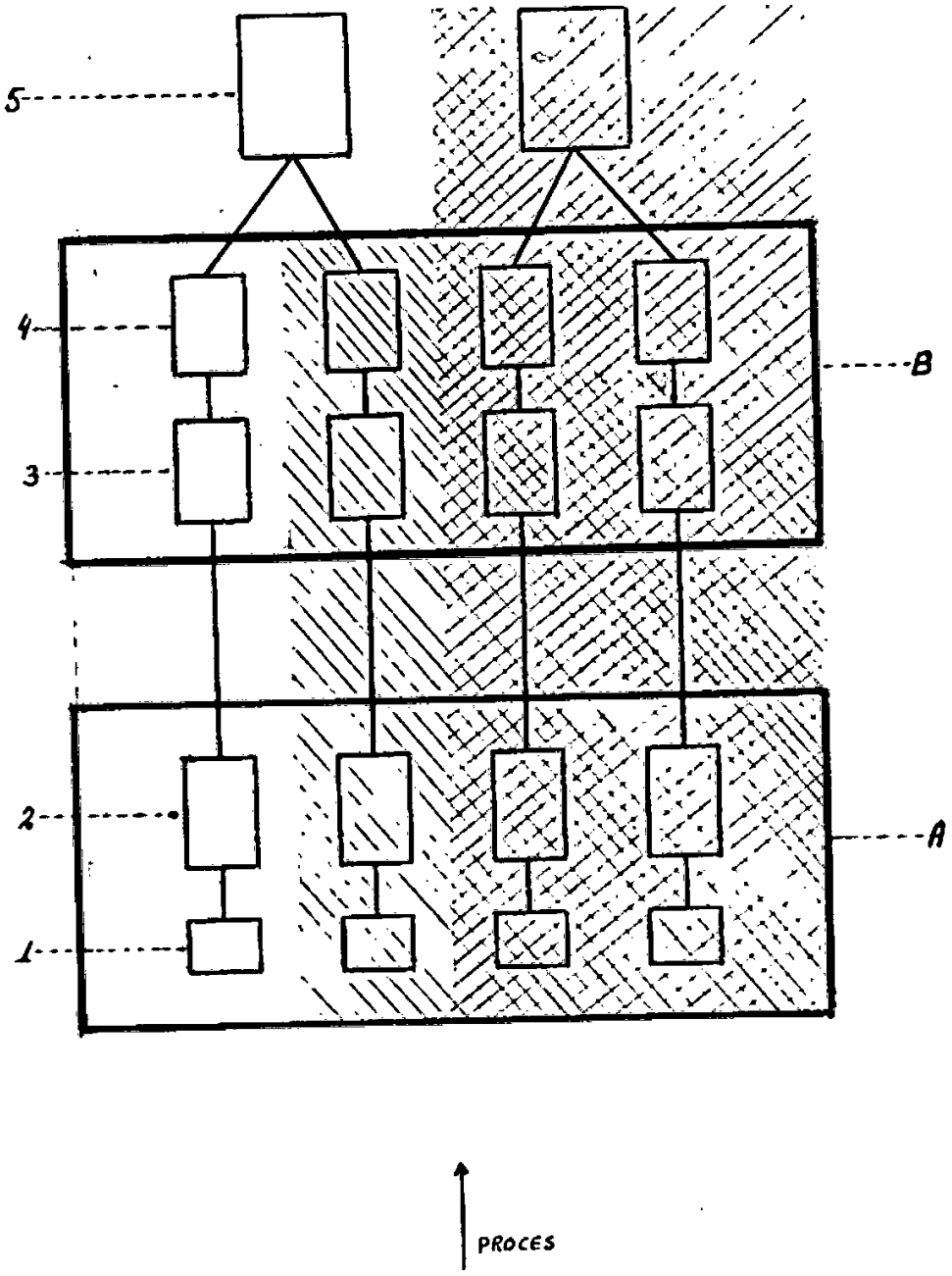

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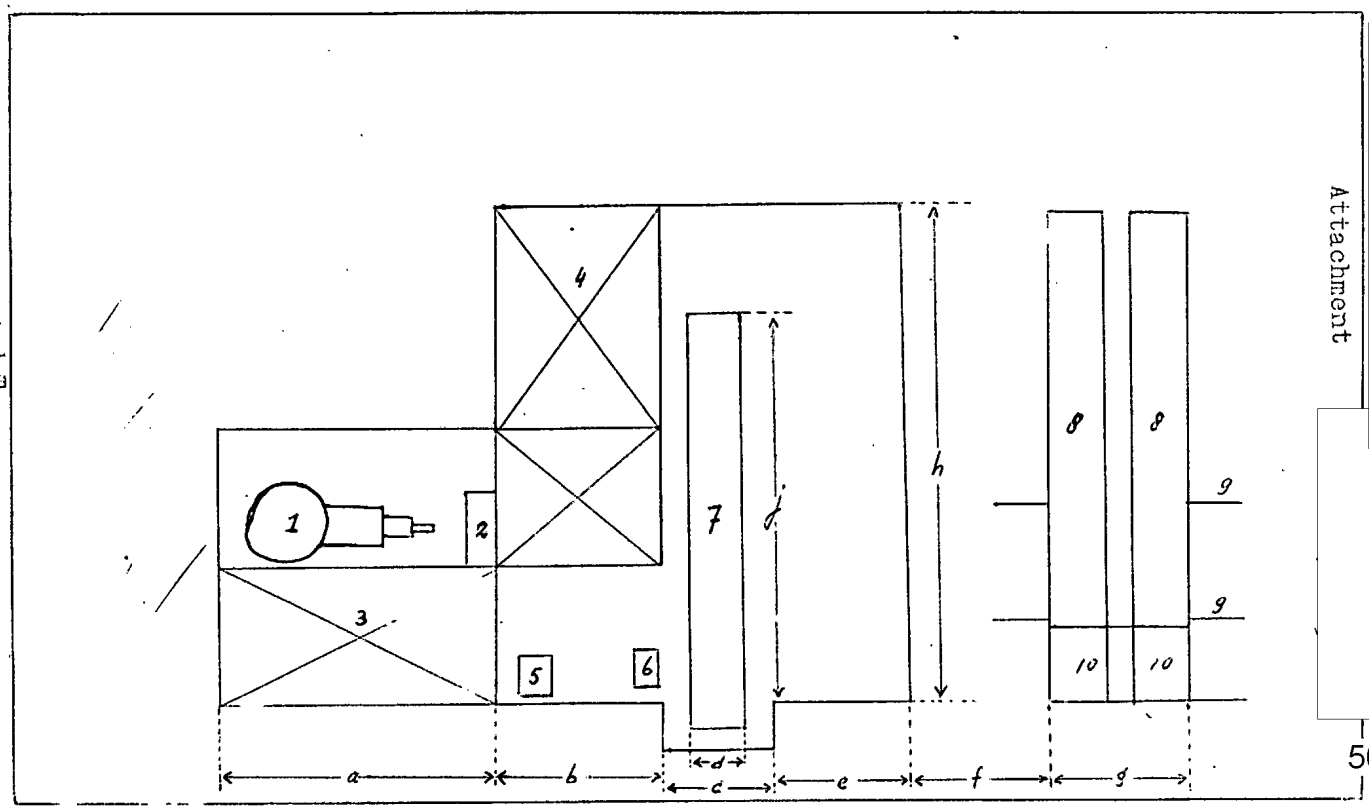

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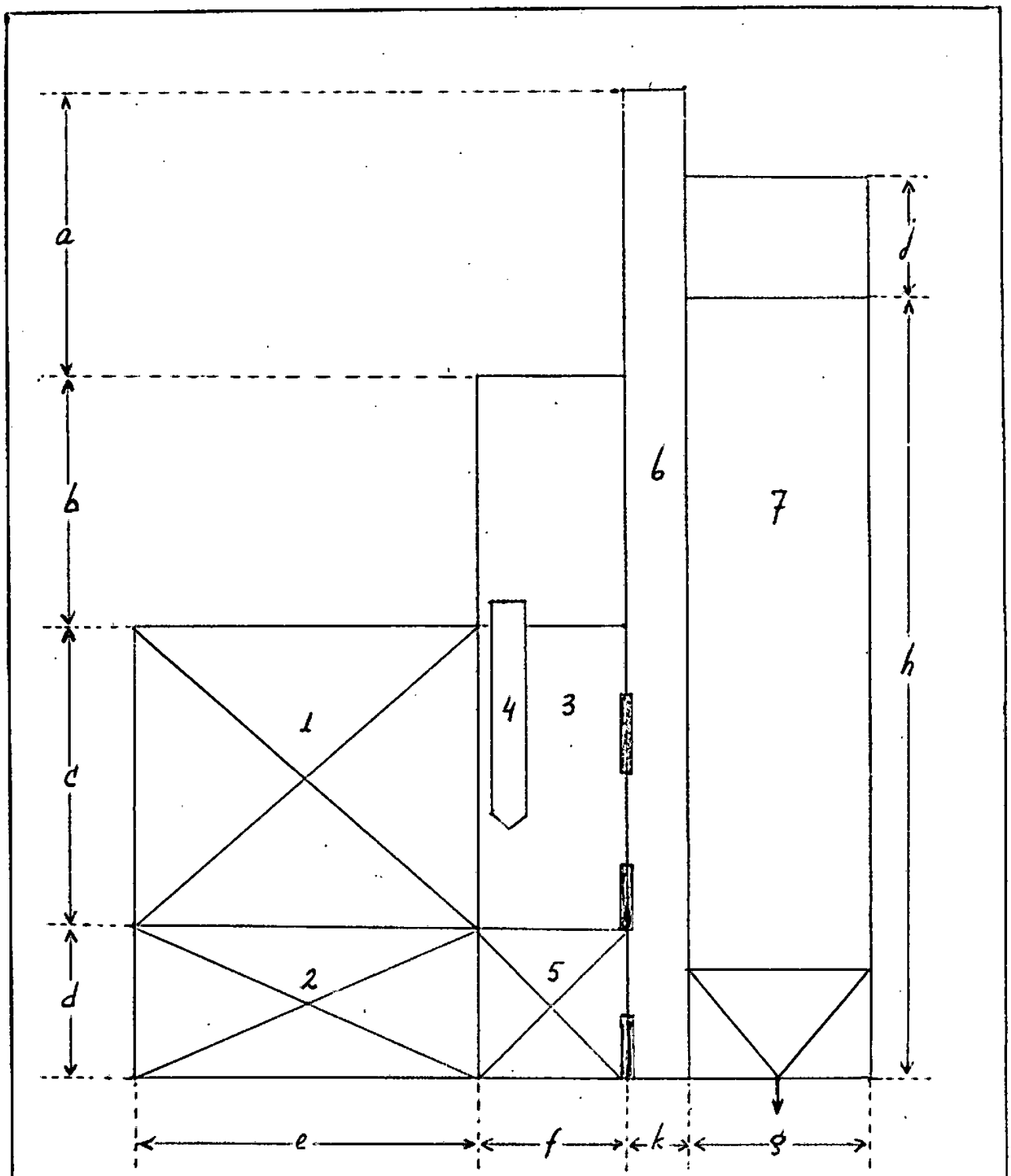

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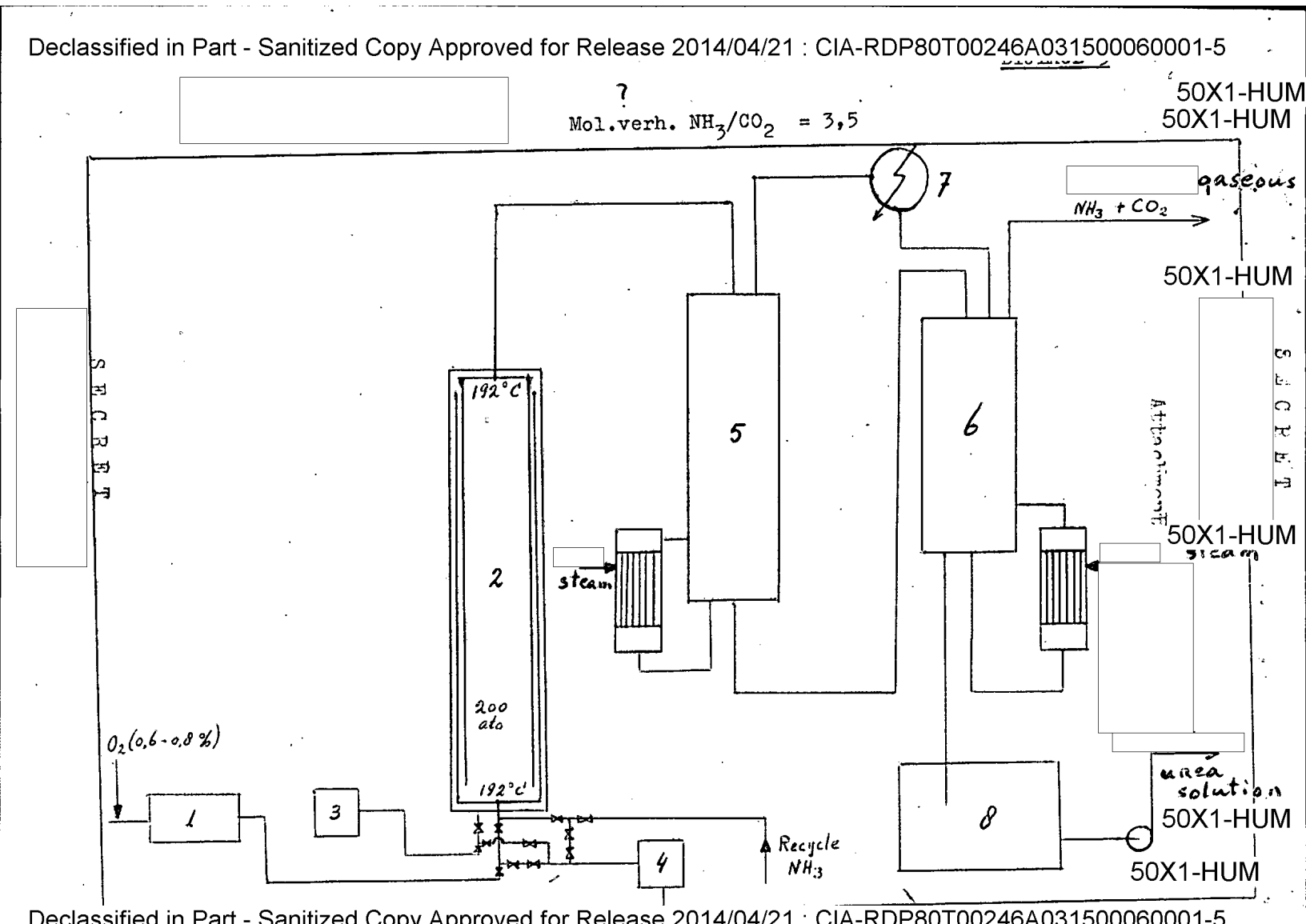

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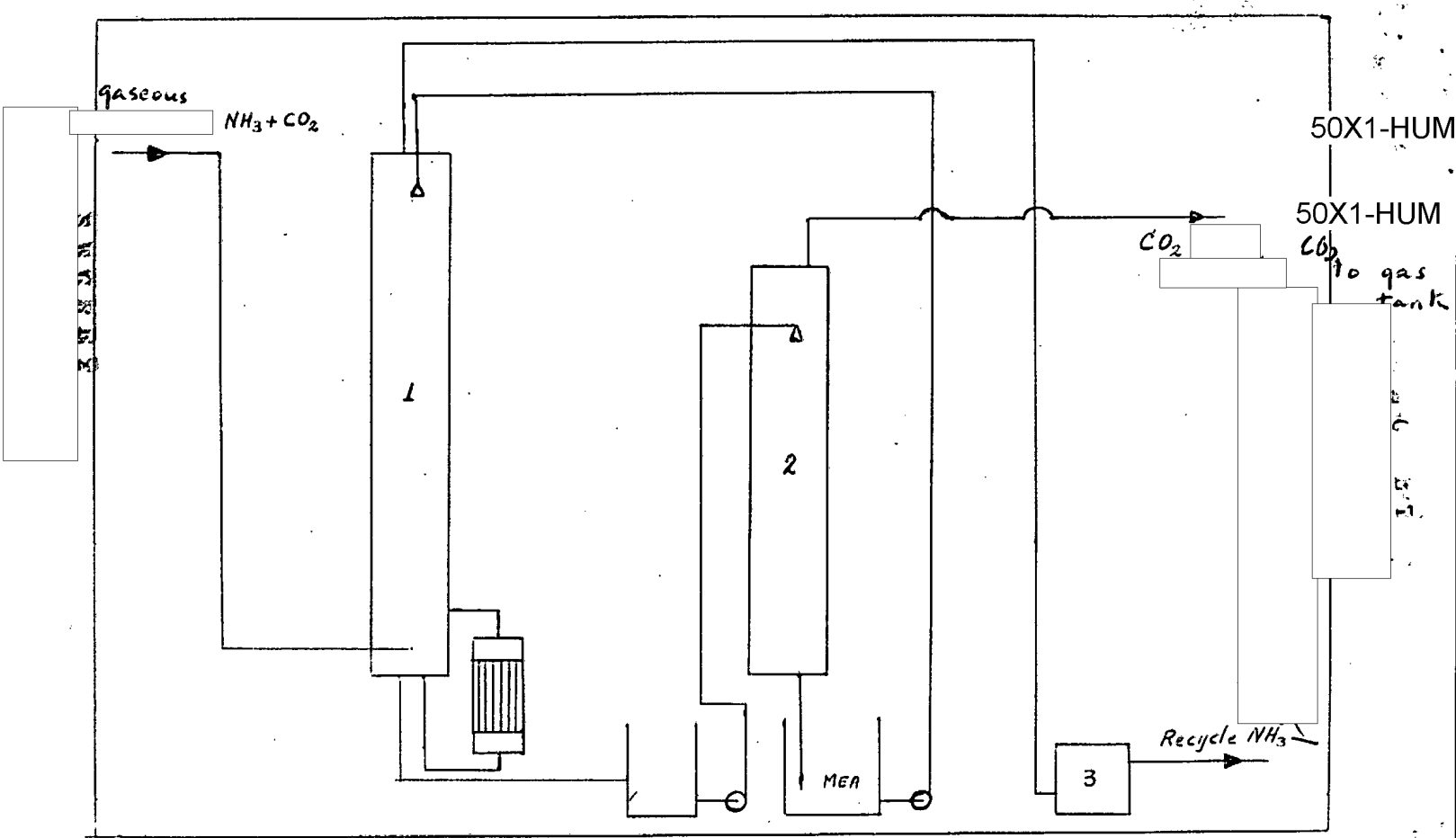

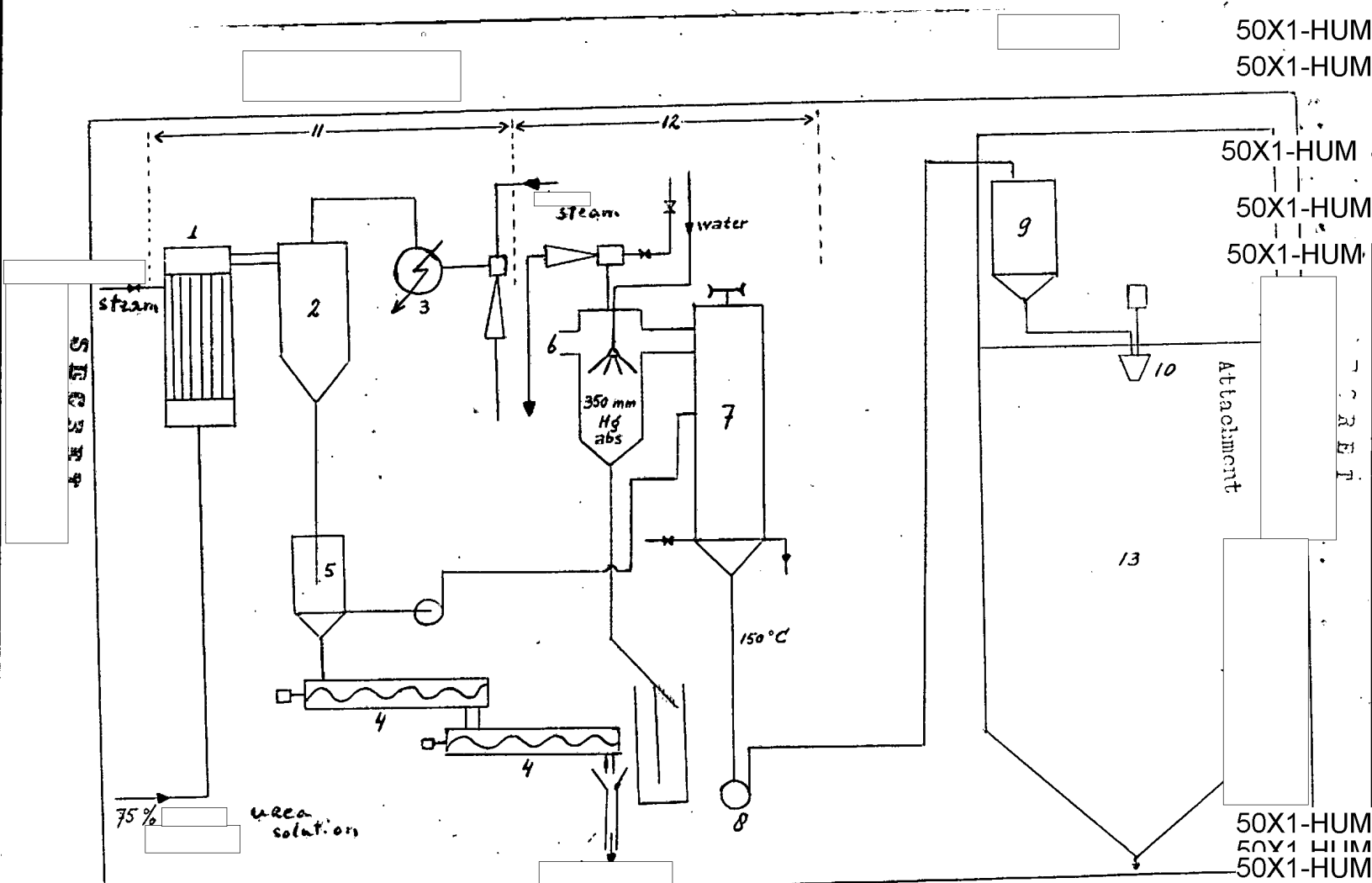

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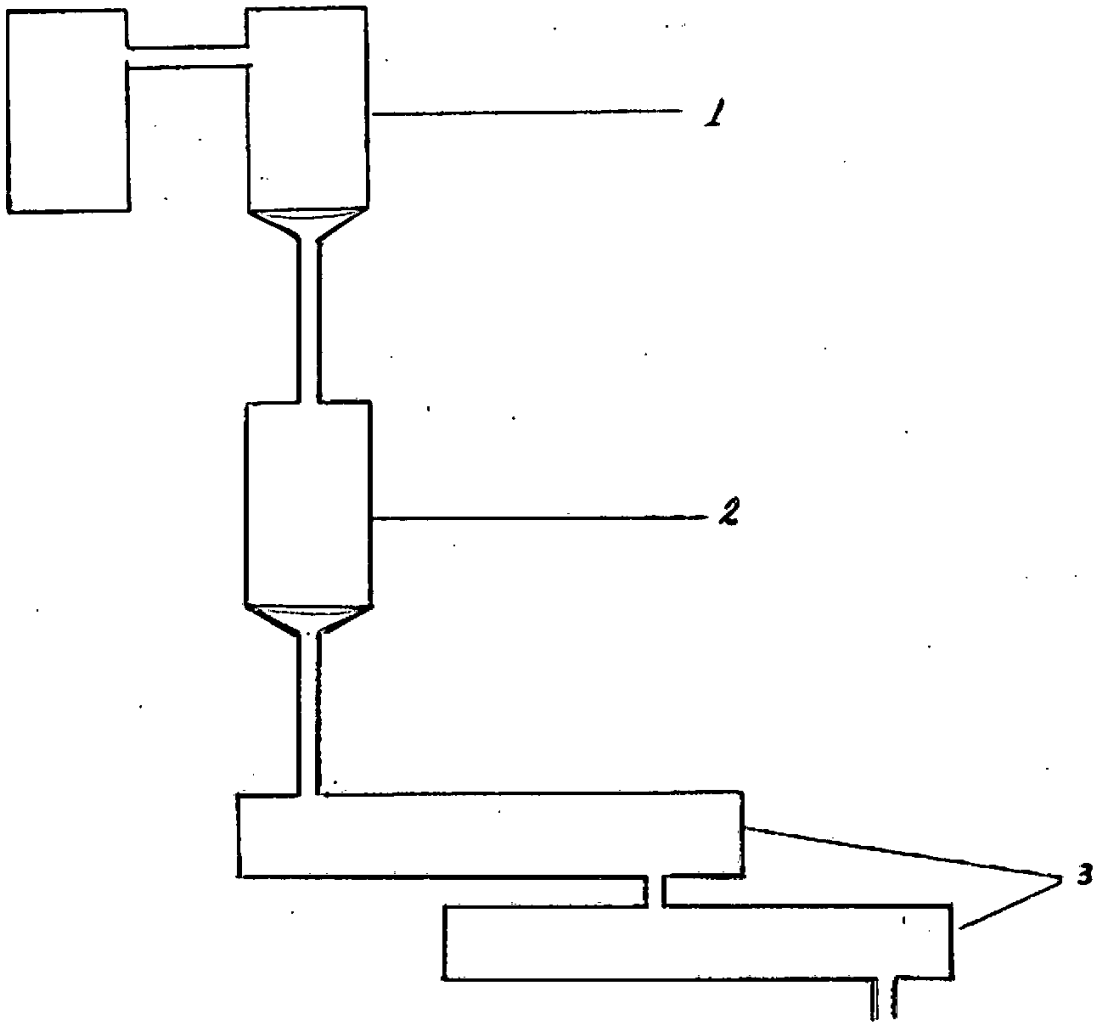

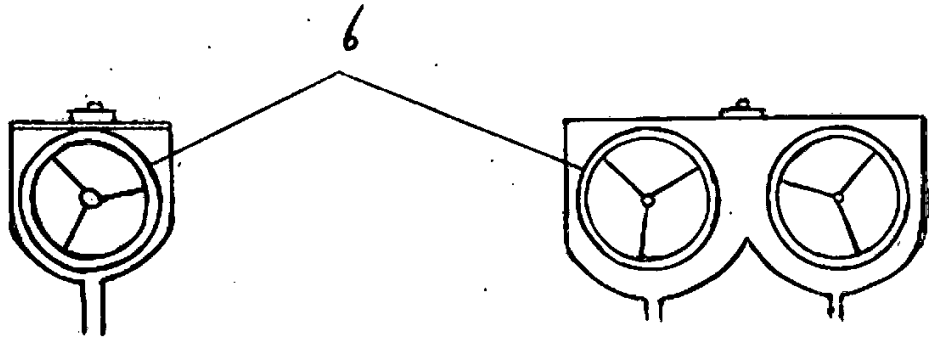

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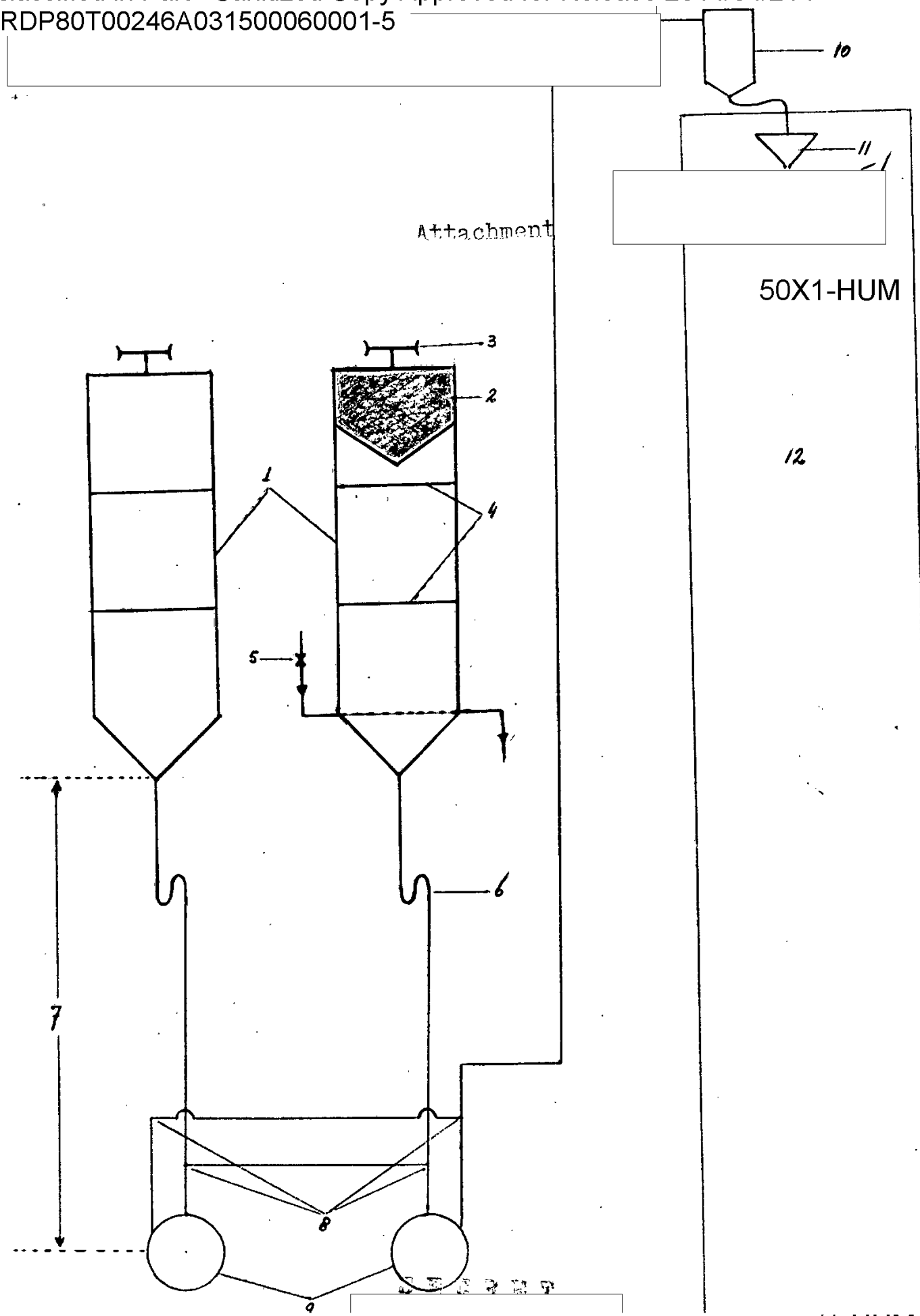

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