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Vienna International Centre, P.O. Box 300, 1400 Vienna, Austria
Tel: (+43-1) 26026-0 · www.unido.org · unido@unido.org

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18475

DP/ID/SER.B/676
28 June 1990
ORIGINAL: ENGLISH

SETTING-UP OF A BOTTLING PLANT COMBINED WITH A BREWERY AND SOFT-DRINK MIXING PLANT

SI/MIC/89/801

Terminal report*

Prepared for the Government
of the Federal States of Micronesia
by the United Nations Industrial Development Organization,
acting as executing agency for the United Nations Development Programme

Based on the work of Guenther K. Dittrich,
expert in production of brewery and soft drinks

Backstopping officer: H. Koenig, Agro-based Industries Branch

United Nations Industrial Development Organization
Vienna

* This document has not been edited.

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1. BACKGROUND SITUATION

1.1. The FSM National Government, and the four State Governments are actively promoting economic development in order to reduce dependence on outside assistance and to generate employment opportunities for the population.

1.2. A request was made to UNIDO to supply an expert to prepare an evaluation report and a pre-feasibility study on the possibilities of establishment of a bottling plant, which would serve as a basis for the Government to take a decision on establishing a bottling plant, combined with a brewery and soft-drink mixing plant. The expert was to make two visits to the FSM. The first mission of two weeks' duration was to:

I. Review the situation in the FSM with regard to beer and soft-drink imports and consumption;

II. Study available proposals for the establishment of a bottling plant combined with a brewery and soft-drink mixing plant;

III. Prepare the required documentation for further bidding proceedings.

A Draft Consultant's Report was prepared and relates to this mission (Appendix 1).

The second mission of four weeks' duration, was designed to:

I. Assist the authorities of the Government of the FSM in the final evaluation work of proposals and new biddings with special attention paid to the technical and technological aspects involved;

II. Assist in the final selection of the lowest acceptable bid and justify the selection from the financial and technical view point;

III. Reassess the selected bid or proposal and prepare a pre-feasibility study, which will be used to advise the authorities of the Government of the FSM on all relevant aspects which may come up;

IV. In cooperation with the Government prepare a final mission report outlining the evaluation work done and the justified conclusion arrived at.

This final report relates to this mission.

2. OFFICIAL ADVERTISEMENT REQUESTING FOR BIDS (TENDERS)

2.1. According to the consultant's proposal to have an official advertisement asking for bids to obtain as many qualified offers on the project(s) as possible, the FSM National Government put those advertisements into three worldwide leading brewing journals:

- Brauwelt No. 45/89
- Brewers Digest Sept./Oct. 89
- Brewing and Distilling Oct. 89

2.2. According to the consultant's proposal, decision was made to ask for turn-key project offers only.

2.3. The text of the advertisement for a brewery turn-key plant was as follows:

see Appendix No. 2.1.

2.4. The text of the advertisement for a soft-drink turn-key plant combined with a fruit juice production was as follows:

see Appendix No. 2.2.

3. LIST OF VALUABLE OFFERS RECEIVED

3.1 Offers for turn-key projects brewery

3.1.1. LEUSHUIS
Projects & Engineering B.V.
Opaalstraat 22
NL-75554 TS Hengelo
Netherlands

3.1.2. DANBREW Consult Ltd.
Rahbeks Allee 21
DK-1801 Frederiksberg C
Copenhagen/Denmark

3.1.3. KOSMOS EXPORT GMBH
Colonnaden 72
D-8000 Hamburg 36
F.R.Germany

3.1.4. AMS Anlagenplanung GmbH & Co
Alte Rabenstr. 32-34
D-2000 Hamburg 13
F.R.Germany

3.1.5. h-consult gmbh
Josef-Geiser-Str. 20
D-8000 München 83
F.R.Germany

3.1.6. AB PRIPPS BRYGGERIER
16186 Bromma
Sweden

3.2. Offers for turn-key projects soft drink plant with fruit juice production

3.2.1. SCHAECO
Schaedlich Engineering GmbH
P.O.Box 46 11 65
D-2856 Hagen - Bremerhaven
F.R.Germany

4. GENERAL DESCRIPTION OF ALL BIDDING COMPANIES

4.1. All companies offering turn-key plants so far, are so called Consulting Companies. They are specialized on delivery of process know-how, planning and design and turn-key projects, especially for brewing and soft drink industry. They do not produce any equipment but offer their own systems, for which they buy the necessary equipment as it is available, thus acting as a general contractor to their clients.

4.2. Exceptions are:

4.2.1. LEUSHUIS offering a different system to all others, producing parts of it by themselves.

4.2.2. SCHAECO offering a containerised system, also producing parts of it by themselves.

4.2.3. PRIPPS, offering a joint venture.

5. TURN-KEY PROJECTS IN GENERAL

5.1. Offers for turn-key projects should normally include all covering design, basic engineering, especially interconnection of all parts of a plant. No matter how many companies are involved in the delivery of all the parts of a project up to the commissioning, the buyer will always have only one counterpart to talk to. This makes things get easier, but of course is also not the cheapest way.

6. RECOMMENDED PRODUCTS

6.1. Beer

Since all necessary raw materials have to be imported it is highly recommended to produce first of all a beer which is based on using malt and hops only. this will give the beer a unique taste and flavor, and therefore a so made beer will not compete with any other beer available on the islands by that time. For such a beer it is also possible to mark it on the label that it is produced according to the German Purity Law for Beer (Reinheitsgebot), which was released by the Duke of Bavaria in 1516 to protect the beer consumers health. Some newly founded smaller breweries within the United States are doing so already.

Once the first beer has been established in the market very well, more products might be developed so setting up a variety of different beers as there is any demand for.

In accordance to the above said, all beer produced shall have export quality, i.e. shelf life of min. 6 months. So the possibility is given to export the beer to countries outside FSM also if there is a chance for.

6.2. Soft Drink

All soft drinks produced should have such a high quality that they can be exported as well. Therefore high quality raw materials have to be imported, i.e. sugar, citric acid and necessary essences. Other than beer, soft drinks will be in competition with imported soft drinks quite inevitable therefore marketing studies should be carried out to find out what kind of soft drinks are the most preferred amongst customers.

7. RECOMMENDED EQUIPMENT

7.1. Beer

To be able to produce a high quality beer under conditions as given on a tropical island all aspects should be taken into a careful consideration.

Therefore a check list was set up (Appendix No. 3.) which describes all main important equipment necessary, as well as showing a scheme of operation which gives best conditions for production. The operation should be fully automatic but switch to hand operation also possible in case of emergency. For this reason a fully computerized system will not work proper and is therefore not recommended.

Main aspects are:

- Malt silo capacity should cover 6 months production in respect of any delay in shipments but should be split into min. two silos;

- Malt milling should have a dry milling system to avoid moulding;

- To reach optimal yields, before the malt is crushed it should be treated through a conditioning device to get the husks smoothened;

- Mashing in device should be fixed on the mashing vessel to be able to set up different mashing formulas for different types of beer;

- Malt handling, milling and brewhouse operations shall be automatic, but as mentioned above it is necessary to be able to switch the system to hand operation in any case of emergency;

- Main fermentation should use cylindroconical fermenters, with cooling jackets at the cone and with automatic temperature control and regulation connected to a carbon dioxide collecting system;

- Storaging can be done in vertical or horizontal tanks with cooling devices;

- For better coagulation of proteinous substances a cold treatment should be done before filtration. Therefore some special equipment is required.

- To be able to blend some tanks together a blending device of min. three connections is required;

- Filtration of the beer has to be done in two steps:

  1. Coarse filtration, using a kieselguhr filter
  1. Fine filtration, using a sheet-filter

- Bottling tanks should have a cooling device, but the filtered beer should not be cooled down below filtration temperature, to avoid chill haze;

- All counterpressure after filtration, under which beer has to be handled up to bottling, should be produced by using CO2 instead of air, to avoid oxidation as much as possible;

- The bottling machine for the same reason should have long filling tubes instead of short ones;

- Capacity of the bottling machine should be offered as b/hr effective, not nominative;
- All other bottling equipment should have a capacity +20 % to the capacity of the bottling machine;
- Packing should be done automatically or semi-automatically, not by hand;
- CIP, cleaning in place plant should cover all equipment in contact with beer, for fully automatic cleaning operation, including pressure pump and return pump.

Further equipment needed is:

- CO2 recuperation plant
- Steamboiler
- Oilfree air compressor
- Electric power generator stand by to run the whole plant in case of power break down
- Cooling system
- Waste water treatment
- All complete piped and wired for automatic operation
- Spare parts for two years operation

7.2. Soft Drink

7.2.1. To produce high quality soft drinks it is essential to have an own carbon dioxide production plant included. Carbon dioxide is used as per 0.6 kg - 0.7 kg/hl soft drinks.

Beer production recuperates approx. 2.5 kg/hl finished beer, but uses also approx. 1.8 kg/hl for counterpressure and carbonating.

So approx. 0.9 kg/hl might be available for soft drink production, giving a limited production capacity.

Besides that is needed:

sugar intake device, sugar dissolving unit, filter, flash pasteurizer, syrup mixers, cooler, carbonation device, pumps, piping, bottling line including tunnel pasteurizer.

7.3. Fruit Juice

7.3.1. For fruit juice production , equipment needed is:

- Screw press
- Separator

- Storage tank
- Flash pasteurizer
- Buffer tank
- Filling unit

8. EVALUATION OF OFFERS IN RESPECT OF TECHNIQUE AND TECHNOLOGY

8.1 Beer

8.1.1. All offers were evaluated very carefully by using the check list (Appendix No. 3). It was to be seen, that most of the offers are missing essential equipment as it is listed below. The numbers behind the items listed, are corresponding to the offers as numbered and listed in paragraph 3.1..

8.1.2. Since the capacity of the brewhouse is the factor, which effectively determines production capacity and thus limits possible extension, a calculation was made to find out capacity optimum.

This calculation was based on 65 hl wort per brew, 240 working days a year, one brew per day, = 15,600 hl wort p.a., equal to 14,040 hl finished beer.

8.1.3. Bottling capacity was calculated as:

14,040 hl of beer p.a. initial capacity
120 bottling days, one shift per day
6 hrs effective bottling per shift
= 19 - 20 hl/hr
= 5900 - 6000 b/hr effective capacity

8.1.4. According to the above mentioned the following list was set up:

Item	missing or not proper selected
- Malt silos	(3.1.2.,3.)
- Malt conditioning before milling	(3.1.1.,2.,3.,4.)
- Grist bin	(3.1.1.,2.)
- Mashing in device	(3.1.1.,2.,3.,4.)
- Size brewhouse capacity	(3.1.1.,2.,3.)
- Automatic control: Malt - Brewhouse	(3.1.2.,3.,4.)
- Spent grain discharge	(3.1.3.)
- Spent grain bin	(3.1.2.,3.,4.)

- Yeast pitching pump	(3.1.2.,4.)
- Cylindroconical fermenters with cone cooling jacket	(3.1.2.,3.,4.)
- Beer blending apparatus with min. three lanterns	(3.1.1.,2.,3.,4.)
- Beer deep cooling devices before filtration	(3.1.1.,2.,3.,4.)
- Beer fine filtration	(3.1.1.,2.,3.)
- Carbonation device	(3.1.1.,2.,3.,5.)
- Sizing bottling line	(3.1.1.,2.,3.)
- CIP return pump	(3.1.1.)
- Oilfree air compressor	(3.1.3.)
- Sterile filter air + CO2	(3.1.2.,3.,4.)

Offer No.	Number of missing parts
1	10
2	15
3	15
4	9
5	1

8.1.5. Prices given

The prices given in the offers are almost budgetary and the companies offering are mostly saying, that the final lay out should be object to further discussions. This means by filling in all parts missing, as listed above, all companies bidding would end up with a sum of approx. 5 - 5,5 mio USD for equipment. This price also should include all parts from planning to commissioning and training at site.

Since most of the prices given are based on different exchange rates it seemed to be necessary to base them all on the same rate. So revised figures are as follows:

		rate given		1.70 DM = 1.-- USD
1.	LEUSHUIS	no rate	FOB	2,330,000.-- USD
			CIF	---
2.	DANBREW	(DM)	FOB	3,394,422.50 USD
			CIF	3,635,597.-- USD
3.	KOSMOS	1.85 DM	FOB	2,477,647.-- USD
			CIF	---
4.	AMS	no rate	FOB	3,202,500.-- USD
			CIF	3,322,500.-- USD
5.	h-consult	1.70 DM	FOB	7,539,650.-- USD
			CIF	---
*)	DANBREW 88	1.791 DM	FOB	7,387,058.80 USD
			CIF	7,725,323.57 USD

*) DANBREW 88 offer, the price was used for comparison. But it has to be remarked, that this price does not include building structure, furniture and office equipment.

Offer No. 5. price includes all building structure and supplementary rooms as this proposal is offering a fully modulized plant, which can be easy mounted together. If it is stripped off those includings, the remaining price is 5,384,500.-- USD . If the prices given by the other companies are completed by adding the missing parts, it will end up at a level of 5.0 - 5.5 Mio USD for equipment, as it was said above.

8.1.6. Recommended Proposal brewery turn-key project

Since offer No. 5. is the one which includes nearly all equipment necessary to ensure a steady production of a high and equal quality beer, all other offers missing partly, this proposal is wotth to be taken into consideration seriously, furthermore as it also offers a very short erection time. It is ready for operation 6 weeks after arrival of the equipment at destinated location.

This system is using the same components the other proposals do, but is more sophisticated and complete and considers all aspects as mentioned in paragraph 7.1.

It is also extendable. A waste water treatment plant is included and well sized. The building needs 1421 m^2 .

All other offers are based on equipment produced in the EEC, except offer No. 5. which is using equipment made in US as much as possible. This is the more remarkable since all manufacturers in the US are supplying to large sized breweries therefore their equipment does not fit with small operations.

8.1.7. General remark

Every proposal taken into consideration must be subject to final discussion in detail and technical specification, before any order can be placed.

8.2. Soft Drink

8.2.1. There is so far only one offer for a soft drink plant combined with a fruit juice production as it is listed in paragraph 3.2.1.. This offer was evaluated very carefully according to paragraphs 6.2. and 7.2..

8.2.2. The capacity of a soft drink plant is mainly limited by the capacity of its bottling line. Since the size of the bottles used for beer is approx. 0.33 l the same size should be used for soft drink as well.

Based on that, calculation for initial capacity is:

4000 b/hr x 0.33 l/b
= 1320 l/hr
= 13.20 hl/hr x 6 hrs effective bottling per shift
= 79.2 hl per one shift
x 240 working days one shift
= 19,008 hl p.a.
(x 120 working days = 9,504 hl p.a.)

8.2.3. Capacity of pouch filling line is calculated as
2,500 pouches/hr x .25 l
= 625 l/hr
= 6.25 hl/hr x 6 hrs per shift
= 37.5 hl/day
x 240 working days = 9,000 hl p.a.
(x 120 working days = 4,500 hl p.a.)

8.2.4. Capacity of lime juice production is min. 1,000 - 2,000 l/day. It needs about 1.0 - 2.0 to of fruit per day. Juice storage capacity is 4 x 20 hl = 80 hl. If this amount of fruits can be provided daily, juice production
= 15 hl/day x 240 working days = 3,600 hl p.a.
x 120 working days = 1,800 hl p.a.

8.2.5. According to the above mentioned and the specifications given in paragraph 7.2. there are no parts missing. It is all well sized but has enough capacity to produce up to the demand possible

8.2.6. Recommendation

The offer as is listed in paragraph 3.2.1., is bidding for a modulized system, which is the smallest available. Its capacity can easy fit up with the demand of the market. It is sophisticated, using partly automatic control but also manual labor in some parts. All aspects as mentioned in paragraphs 6.2 and 7.2 are considered. It is also extendable. Waste water treatment is included and well sized. The building needs 840 m^2. the proposal is worth to be taken into serious consideration.

8.2.7. Remark

It has to be remarked again that every proposal taken into consideration must be subject to final discussion in detail and for technical specification, before any order can be placed.

9. JOINT VENTURE

9.1. Proposal PRIPPS

The proposal handed in by Pripps, listed in paragraph 3.1.6., does not compete with the other five offers. This company, which is a wellknown Swedish brewery offers instead of a turn-key operation a joint venture. The offer was handed to E.D.A..

9.2 Description

It is proposed that a local company incorporated in Pohnpei, with the ownership to be PRIPPS (50%), the State of Pohnpei through the Economic Development Authority (10%) and Sokehs Municipal Government (40%). PRIPPS would be given the managerial responsibility for the day to day operations of the company. The company would preferrably have a Board of Directors consisting of 4 persons. A local citizen would assume the role of Chairman, whilst one member could be the Managing Director.

The company would have an authorised and paid-up share capital of USD 1.0 million. Of the total investment of USD 3.5 million, 2.5 million would be financed by a loan defined in USD of other suitable

currency, and an additional USD 0.5 million could be financed through an overdraft facility with a local commercial bank if needed for operating capital.

It is anticipated the overseas loan would be fully repaid by the end of year 6, with repayments commencing at the end of year 2. An effective interest rate of % is envisaged.

9.3. Background

PRIPPS is proposing joint ventures throughout the South Pacific area and already running one brewery at Tonga, erecting an other one in Vanuatu.

The brewery in Tonga is a joint venture between PRIPPS and the Tongan Government. In Vanuatu it is a joint venture between PRIPPS, the Development Bank of Vanuatu and Vanuatu National Provident Fund.

This projects are designed to serve small communities. It is said by PRIPPS that some mechanization and automation are replaced by manual labor. It is sized to produce 15,000 hl - 30,000 hl beer p.a.. Such a unit can be aquired for USD 3.0 million. Total investment would be 3.5 million USD.

9.4. Conceptions

Comparing those figures with those given in paragraph 8.1.5. it is shown clearly that the PRIPPS proposal is based technically and technologically on manual labor. But is also clearly saying that PRIPPS is taking full responsibility for the equipment as well as all management. But to fit with the demand for a high quality beer as described in paragraphs 6.1. and 7.1. surely some improvements will be necessary. This has to be matter of further discussions since specifications given by PRIPPS are not very comprehensive.

9.5. Recommendation

It is therefore recommended to take the possibility of a joint venture with an experienced partner also very seriously into consideration since the costs are very reasonable. But guaranties should be given that this brewery is able to produce a beer of a high superior quality as it is mentioned in paragraph 6.1.. Of course the necessary agreements for a joint venture must be set up in respect of the existing law, to give both parties the same rights.

10. ECONOMIC VIEW POINTS

10.1 Basic information

10.1.1. Consumption of beer and soft drinks according to the annual report of the Office of Planning and Statistics, years 86/89

10.1.1.1. Beer

BEER ESTIMATED VOLUME OF IMPORTS BY STATES
(LITRES USD 0.1127/L DUTY)

YEAR	KOSRAE	POHNPEI	TRUK	YAP	FSM
1986	207,436	663,727	290,204	505,688	1,667,054
1987	158,492	559,539	458,465	504,916	1,681,411
1988	211,029	592,786	702,263	498,900	2,004,978
1989	174,685	826,948	725,395	550,248	2,277,196
AV 86/89	187,890	660,750	544,082	514,938	1,907,660

10.1.1.2. Soft Drink / Cordials

SOFT DRINK/CORDIALS ESTIMATED IMPORT VOLUMES
BY STATES (LITRES USD 0.0563/L DUTY)

YEAR	KOSRAE	POHNPEI	TRUK	YAP	FSM
1986	213,197	595,133	554,263	211,208	1,573,801
1987	151.670	710,497	502,238	176,004	1,540,409
1988	225,453	829,147	865,915	326,679	2,247,194
1989	259,698	949,787	846,643	235,702	2,291,829
AV. 86/89	212,504	771,141	692,265	237,398	1,913,308

10.1.1.3. Remark

During the duration of the consultants first mission in June 89 the figures of 88 and 89 consumption for beer and soft drinks were not jet available. The increase of both items during the last two years is very impressive indeed.

10.2. Assumptions

10.2.1. According to the figures given above it was assumed that production of beer to meet the demand in the FSM will be:

	Beer	Soft Drink
1. year	5,500 hl	6,000 hl
2. year	9,000 hl	9,600 hl
3. year	13,500 hl	13,400 hl

10.2.2. This assumed production figures are covering the total demand of the market within FSM as it is shown below:

	Beer and Soft Drink
1. year	25 % approx.
2. year	50 % approx.
3. year	70 % approx.

The assumption is based on the average figures of 86/89 as given in paragraphs 10.1.1.1. and 10.1.1.2..

10.3. Sales prices recommended

10.3.1. Beer

At present the beer is sold at a retail price of .60 USD - .80 USD per bottle or can. This price should be held also by a brewery operating within FSM

10.3.2. Soft Drinks

At present soft drinks are sold at a retail price of .50 USD per bottle or can. This price should be held also by a soft drink plant operating within FSM.

10.3.3. Remark

To protect the production of beer and soft drinks in the FSM it will be necessary to increase the import tax on beer and soft drinks so that the local products can take advantage.

11. FINAL CONCLUSIONS

11.1. Import figures for beer and soft drinks

The updated figures on import of beer as well as soft drinks are demonstrating very clearly a steady increase of consumption since 1995. Therefore efforts should be strengthened to introduce beer and soft drink production into FSM.

11.2. Recommended products

From the very beginning all efforts should be made to start up with high quality products to be able even to export them into other countries by demand.

11.3. Recommended machinery equipment

To come up with a high quality product it is necessary to have a well sophisticated modern machinery equipment. Special care has to be taken for the cooling devices and carbon dioxide situation. But also all other equipment should be at top standard.

11.4. Evaluation of offers

The evaluation of the offers was done in respect of what was mentioned before and a check list was set up to be able to compare the sometimes very different proposals. As one can see, most of those offers are missing essential parts to secure the production of high quality products, considering that the enterprises be located on isolated tropical islands, where greater allowance has to made for external and unforeseen possibilities.

The check list is appendix No. 3. to this report. Concerning the offers for a turn-key brewery only one offer includes nearly all equipment demanded. It should be taken into serious consideration.

For the soft drink plant only one offer was made so far which is very considerable too.

Whatever the decision on the project(s) will be, as it has been said repeatedly, brewery and soft drink plant should be kept separate.

11.5. Possible Enterprises

11.5.1. Turn-key projects

A turn-key plant, operated by FSM enterprises should be equipped with modern sophisticated machinery, for which initial investment costs are higher. Besides this all responsibility has to be taken by a

FSM enterprise. Since there are experienced experts, who are able to run such an operation, not available within FSM at that time, expatriates have to be hired for.

11.5.2. Joint venture

An other possibility to open up such projects is to establish a joint venture with an experienced partner. The partner takes full responsibility for not only management but also for the products and the entire operation. For this he might decide to use low tech equipment, hand operated, but as it was mentioned above, high quality products need sophisticated machinery equipment too.

For this reason a partner has to be chosen, who is willing and able to follow up the same ideas as explained in paragraphs 6. + 7..

11.5.3. Remark

To make a decision whether one way or the other will be best for the FSM is very difficult and both ways have to be evaluated very carefully, and it does not mean that one will exclude the other.

This report shows th technical and technological aspects to be considered but cannot recommend on political decisions.

11.6 Not yet answered questions, raised in the Consultant's Draft Report (Appendix No. 1)

11.6.1. Main questions were not yet answered satisfying enough for the forthcoming of the project(s). They are all raised in chapter 7. draft consultant's report.

11.6.2. Especially on questions concerning all inter island freight services and limits, information was not very comprehensive. But it has to be remarked, that a Nationwide operating company might face considerable obstructions on that matter, thus shrinking all Nationwide planned operations to possibilities for single communities only.

11.7. Further Proceedings

11.7.1. Decision has to be made about a to be newly founded company, which will run the enterprise(s), concerning its structure, i.e. whether it will be a private, Goverment,

or both sharing company.

11.7.2. Decision has to be made whether the project(s) are to be operated as a venture of a FSM company formed up so ever, or as a joint venture with an experienced partner.

11.7.3. Decision has to be made for the location of the site(s) on which the project(s) can be realized.

11.7.4. Site -survey has to be undertaken as soon as possible after site(s) have been selected.

11.7.5. Site - survey should include all as mentioned in the consultants draft report paragraph 7.6..

11.7.6. When these steps have been done the equipment for the project(s) has to be negotiated for final specification before order is placed. It is recommended that the Government of the FSM and entities involved should have available the services of an independent expert to assist them for the discussion of all aspects being subject of final specification.

11.7.7. It should be kept in mind that all decisions made on the forthcoming project(s) shall care about the separation of brewery and soft drink plant into at least two bottling lines (see also draft consultant's report paragraph 4.2.).

11.7.8. Initial capacity of the project(s) should be sized as mentioned in paragraph 8. of this report.

12. EXPERT'S RECOMMENDATIONS

12.1. Company

To realize the project(s) as soon as possible, a company of private character has to be founded, sharing pertly with the National Government of the FSM as well as intersted State Governments and Municipalities.

12.2. Operation

This company shall operate nationwide so that all the resources of the FSM can be used.

12.3. Products

The products of this company shall be of such high quality that export is possible also.

12.4. Brewery

The installation of a brewery has to be done first after foundation of the company.

Reasons are:

- It is easier to create a beer with a unique taste and flavor.
- The by-products create more enterprises, like animal breeding.
- It creates more employment.

It has to have an carbon dioxide recuperation plant. This plant will produce more carbon dioxide as it is reused for beer production.

Therefore as soon as beer production is established well, the surplus production of carbon dioxide can be used to produce soft drinks (see also paragraph 7.2.1.).

12.5. Soft Drink Plant

Indroduction of soft drink production should be the second step, using surplus carbon dioxide from the brewery, thus saving costs for a carbon dioxide production plant until demand for soft drinks is higher than carbon dioxide recuperation can follow up.

Comparing the calculations for bottling beer and soft drinks (see paragraphs 8.1.3. and 8.2.2.) and for assumed initial production (see paragraph 10.2.1.) it will be possible to use one bottling crew for two lines during the initial phase.

But refering to paragraph 4.2. draft consultants report, the bottling line for soft drinks has to be a separate second line. Therefore it is recommended to locate the soft drink plant aside the brewery, so using the resources of the brewery but also have the production lines separated.

12.6. Fruit Juice Production

The production of fruit juice should be taken into consideration later on. Before any decision can be made upon, the amount of fruits, daily available has to be identified.

12.7. Location

The brewery should be located on Pohnpei Island close to the harbor to ease transportation problems, and also close to Kolonia, because there will be the main customers area initially.

12.8. Turn-key project

The brewery is to be a turn-key project, using sophisticated equipment to produce high quality beer.

Only one proposal evaluated, offer No. 5., is including nearly all machinery equipment needed together with a sophisticated system, considering the situation on a tropical isolated island as well, to enable the brewery to produce various types of high quality beer.

It is therefore recommended to start negotiations with that bidding company as soon as the local company to be founded has been formed up, because such negotiations need competent counterparts.

Furthermore it is also recommended to negotiate the details of a separate bottling line for soft drinks with the only bidding company. Negotiations should be based on the recommendations given in paragraph 12.5..

12.9. Joint venture

A joint venture between a foreign company and the company formed up in FSM can held advantages for both parts, provided that the foreign partner is well experienced and able and willing to bring in qualified know-how as well as sophisticated technology and machinery equipment to enable the brewery to produce high quality beer.

Therefore it is recommended to look for and invite potential Partners as well. They should be potent enough to take part of the risk.

But it has to be remarked, that these negotiations held under the aspects of a joint venture will not exclude nor eliminate the recommendations given in paragraph 12.8..

12.10. Expert's assistance

This report is helping for better understanding of the single steps and measures to be taken to realize the project(s). As it has been proved by evaluation of the existing offers, this report cannot replace or substitute the assistance of an independent expert for brewing and soft drink technology, needed for the upcoming decisions necessary to be made as well as negotiations and discussions of the details of each single step and further evaluations.

Therefore for the further proceeding the National Government of the FSM and the entities involved have to have the assistance of such an expert on time, i.e. from the very beginning to continue the work on the project(s) and help them to avoid any possible mistakes, which might become very expensive sometimes.

The expert to be engaged should have experience and know-how about production of beer and soft drinks under tropical conditions considering the situation on isolated tropical islands as well, and has to be convinced by himself that all possibilities described in this report can be realized.

Finally but most important it has to be recommended to undertake all steps necessary to make sure to have the really needed assistance of the expert on time.

1. BACKGROUND SITUATION

1.1 The political system of the Federated States of Micronesia (FSM) is described in the FIRST NATIONAL DEVELOPMENT PLAN 1985-1989, Chapter One, Section II.

2. ECONOMIC SITUATION

2.1 The FSM National Government, and the four State Governments, are actively promoting economic development, in order to reduce dependence on outside assistance and to generate employment opportunities for the population.

2.2 A request was made to UNIDO to supply an expert to prepare an evaluation report and a pre-feasibility study on the possibilities of establishment of a bottling plant, which would serve as a basis for the Government to take a decision on establishing a bottling plant combined with a brewery and soft-drink mixing plant. The expert was to make two visits to the FSM. The first mission, of two weeks' duration, was to:

i. Review the situation in the FSM with regard to beer and soft-drink imports and consumption;

ii. Study available proposals for the establishment of a bottling plant combined with a brewery and soft-drink mixing plant;

iii. Prepare the required documentation for further bidding proceedings.

This report relates to this mission.

The second mission, of four weeks' duration, is designed to:

i. Assist the authorities of the Government of the FSM in the final evaluation work of proposals and new biddings with special attention paid to the technical and technological aspects involved;

ii. Assist in the final selection of the lowest acceptable bid and justify the selection from the financial and technical view point;

iii. Reassess the selected bid or proposal and prepare a pre-feasibility study, which will be used to advise the authorities of the Government of the FSM on all relevant aspects of bottling, brewery of beer and soft-drink production which may come up;

iv. In co-operation with the Government prepare a final mission report outlining the evaluation work done and the justified conclusion arrived at.

3. BASIC STATISTICS

3.1 At the present time all beer and soft drinks have to be imported. For the years 1985-87 the annual import figures for the FSM were, on average:

i. 17,000 hectoliters of beer

ii. 15,000 hectoliters of soft drinks

Differences between years are very low.

3.2 The annual value of imports of beer and soft drinks for the years 1984-87, for the FSM, was on average:

i. Beer - US$1,726,464

ii. Soft drinks - US$1,025,407

(Source: FSM Trade Bulletin, May 1988)

4. FEASIBILITY

4.1 Based on the figures shown in the previous paragraph it should be feasible to construct and operate a small-to-medium sized brewery and a small soft drink plant in the FSM. The latter could be combined with a fruit juice plant. There are other countries in the South Pacific with comparable breweries - for example, Fiji, Western Samoa and Tonga.

4.2 Because of the possibility that beer and soft drinks can contaminate each other, especially in the tropics, it is recommended that the plants be kept separate. They could be located in the same State or in different States.

4.3 Since the beer, as well as the soft drinks and fruit juices, will be sold throughout the FSM, and will also be exported where possible, it would seem appropriate to establish nationwide companies so that all the resources of the FSM can be used.

5. EXISTING OFFERS

5.1 So far two offers have already been made to introduce beer and soft drink production to the FSM. Both were submitted to the Economic Development Authority (EDA) of Pohnpei State.

5.2 Danbrew Consult Ltd., Rahbeks Alle' 21, DK-108 Frederiksberg, Denmark, is offering a brewery plant, soft drink plant and fruit juice production plant, all combined in one factory as a turn-key project (see quotation No. 4408, dated November 1988). A separate, revised submission, project presentation No. 4408 of November 1988, was also provided.

5.3 The San Miguel Corporation Beer Division, 6766 Avala Avenue, Makati, Metro Manila, P.O.Box 271, Manila, Philippines, submitted a proposal through Messrs. Huppmann Handels GmbH. of West Germany, for a brewery plant only.

5.4 Both offers are incomplete in respect of the situation on isolated tropical islands, where greater allowance has to be made for external and unforeseen possibilities. Some revisions are therefore necessary. In particular the Danbrew proposal is missing a silo storage plant for malt. The San Miguel/Huppmann proposal is also missing a malt silo storage plant, as well as malt cleaning devices, CO_2 production plant including a cylinder filling unit and a waste water treatment plant.

5.5 There is also an offer from Danbrew for a brewery with a capacity of 5,000 - 10,000 hectoliters per annum. This offer is not as complete as the offer mentioned in paragraph 5.2.

6. PROPOSED PROJECT

6.1 An official advertisement asking for bids should be made by the Government of the FSM, after a decision on point 4.2 is reached - whether there should be separate plants for the brewery and soft drinks.

6.2 It is recommended that the Government of the FSM should have available the services of an independent expert to check through the bids and to assist the government in controlling the construction and management of the proposed project.

6.3 The offer made by Danbrew, described in paragraph 5.2, also includes a feasibility study on a brewery, as well as a soft drink plant combined with fruit juice production. It is described in the revised project presentation 4408 of November 1988. It should therefore be studied by the government, since many commercial points are made, but as it is based on an assumption that there shall only be one factory not all points may be valid.

7. NECESSARY STEPS FOR OFFICIAL ADVERTISEMENT

7.1 Size and capacity.

7.1.1 Initial capacity should not exceed more than half of the imports i.e. 8.000 - 10.000 hl per annum, but capacity should be extendable to accommodate increased demand.

7.1.2 The area of the site should be designed to accommodate subsequent expansion.

7.2 The company name should be general enough to appeal to all States of the FSM and to potential export markets. A possibility might be "Micronesian Breweries".

7.3 A decision has to be made whether production of Micronesian beer, or beer under license, shall be started. It is recommended that the brewery should not produce beer under license, and should aim to provide a fresh product. The beer produced in the FSM should have its own significant taste, and should not be directly comparable or competitive to any other beer imported to the FSM.

7.4 Decisions on the location of the site(s) should take account of the availability of:

- water supply
- power supply
- road connections to the harbor(s)

7.5 Site surveys should be undertaken.

7.6 Water

7.6.1 Amount available hl/hr.
7.6.2 Quality available

- Chemical analysis
- Microbiological analysis

7.6.3 The chemical water analysis is important in respect of whether a water treatment plant has to be set up or not to improve the chemical consistency of the water.

7.6.4 Test drills should be made before the site is selected.

7.7 A decision has to be made by the government entities in the FSM involved in the project(s) on whether the official invitation to bid should ask for turn-key offers or offers to supply the component parts of the project. Since turn-key project offers include all covering design basic engineering, especially interconnection of all parts of a plant, it is recommended to have turn-key project offers only.

7.8 All inter-island freight services have to be identified.

7.9 All freight limits i.e. size of containers, weight of containers, harbor capacity, etc. have to be identified.

7.10 The kind of work which can/should be done by local companies on constructing the factory buildings and on road construction on areas inside the plants has to be determined.

7.11 In requesting bids it will be necessary to know the temperature of cold tap water (this should be as low as possible).

7.12 Decisions have to be made whether the beer, soft drinks and fruit juices are to be bottled or canned, and whether the packings should be returnable or not. It is recormended to have returnable bottles, which have to be refunded, for both factories. This will also decrease the costs of packing because returnable bottles are designed to be circulated almost 15-20 times. Remark: Cans are not returnable. Non-returnable bottles might survive 3-4 circulations.

8. OFFICIAL REQUEST FOR BIDS (TENDERS)

8.1 To obtain as many qualified offers on the project(s) as possible it is necessary to have an official advertisement asking for bids. Separate bids should be provided for the brewery and soft drink plants.

8.2 Interested parties should be invited to hand in their offers to the FSM National Government, by a specified time.

8.3 The advertisement should specify the capacity wanted, and indicate the scale of possible extensions. The initial capacity of the brewery should be 10,000 hl beer p.a., extendable to 20,000 hl. This is because the size of the brewhouse is the factor which effectively determines capacity and thus limits possible extension. The capacity of the soft drink plant should initially be 10,000 hl p.a., extendable to 20,000 hl p.a. Therefore a capacity of the bottling line of 8,000-10,000 bottles/hours is suggested.

8.4 The tenders should show the preliminary layout and the production flow scheme.

8.5 The tenders should be for turn-key projects only, but they should include malt storage facilities as well as waste water treatment, cooling systems which are not based on ammonia, CO_2-recuperation and production systems, including cylinder filling units. The bottling line should include a pasteurisation unit. For the soft drink plant the tenders should include waste water treatment, cooling system which is not based on ammonia, COz-productions system, including cylinder filling unit, pasteurisation unit.

9. CONCLUSION

Answers on the questions raised in this paper should be prepared in time for the consultant's next visit. Draft documentation for further bidding proceedings is included as Appendix 1. Separate outlines are provided for the brewery and the soft drinks plant.

The Government of the Federated States of Micronesia

announces that it has decided to introduce beer production to the FSM.

A brewery shall be constructed with an initial capacity of 10,000 hl beer p.a., extendable to 20.000 hl p.a. It is to be a turn-key project.

Parties bidding have to consider that the brewery is to be located on an isolated tropical island, where greater allowance has to be made for external and unforeseen possibilities.

The tender has to include:

- Malt silo storage plant
- Malt cleaning devices including magnet
- CO_2-recuperation/production unit including cylinder filling unit
- Cooling system, which is not based on ammonia
- Bottling: returnable bottles, contents 0.320—0.350 l
- Pasteurization unit in the bottling line
- Emergency generator
- Waste water treatment
- Preliminary layout and production flow scheme
- Electrical power required.

All parties interested are invited to submit offers within six weeks of the appearance of this advertisement, but shall give notice in advance to the National Planner of the Federated States of Micronesia at the address below. Proposals on financing arrangements will be welcome. The Government of the Federated States of Micronesia reserves the right to reject any and all bids and or to waive any informalities or imperfections in the bidding in the interest of the Government.

All bids should be submitted in English, and all prices should be in US-Dollars. Bids should be delivered to:

NATIONAL PLANNER
GOVERNMENT OF THE FEDERATED STATES OF MICRONESIA
PO BOX 538
KOLONIA, POHNPEI FM 96941
EASTERN CAROLINE ISLANDS

TELEPHONE (691) 320 2820/2821
TELEX 6807 FSMGOV FM
FAX (691) 320 2428

The Government of the Federated States of Micronesia

announces that it has decided to introduce soft-drink and fruit juice production to the FSM.

A soft-drink plant combined with fruit juice production shall be constructed with an initial capacity of 8.000—10.000 hl p.a., extendable to 20.000 hl p.a. It is to be a turn-key project.

Parties bidding, have to consider that the plant is to be located on an isolated tropical island, where greater allowance has to be made for external and unforeseen possibilities.

The tender has to include:

- — CO_2-production plant including cylinder filling unit
- — Cooling system which is not based on ammonia
- — Bottling: returnable bottles, contents 0.320—0.350 l
- — Pasteurization unit in the bottling line
- — Emergency generator
- — Waste water treatment
- — Prelimary layout and production flow scheme
- — Electrical power required.

All parties interested are invited to submit offers within six weeks of the appearance of this advertisement, but shall give notice in advance to the National Planner of the Federated States of Micronesia at the address below. Proposals on financing arrangements will be welcome. The Government of the Federated States of Micronesia reserves the right to reject any and all bids and or to waive any informalities or imperfections in the bidding in the interest of the Government.

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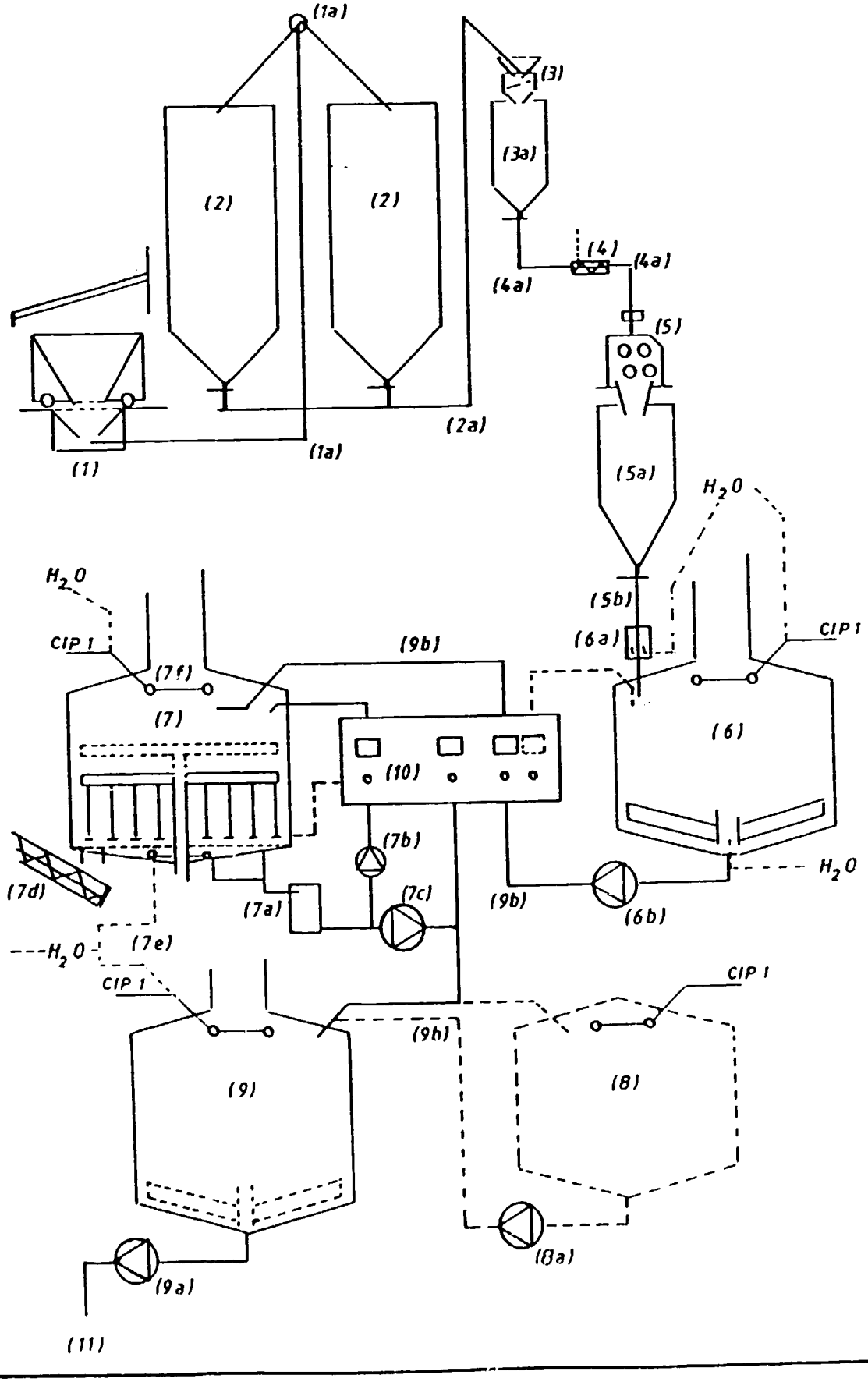
OPERATION SCHEME

WORT PRODUCTION



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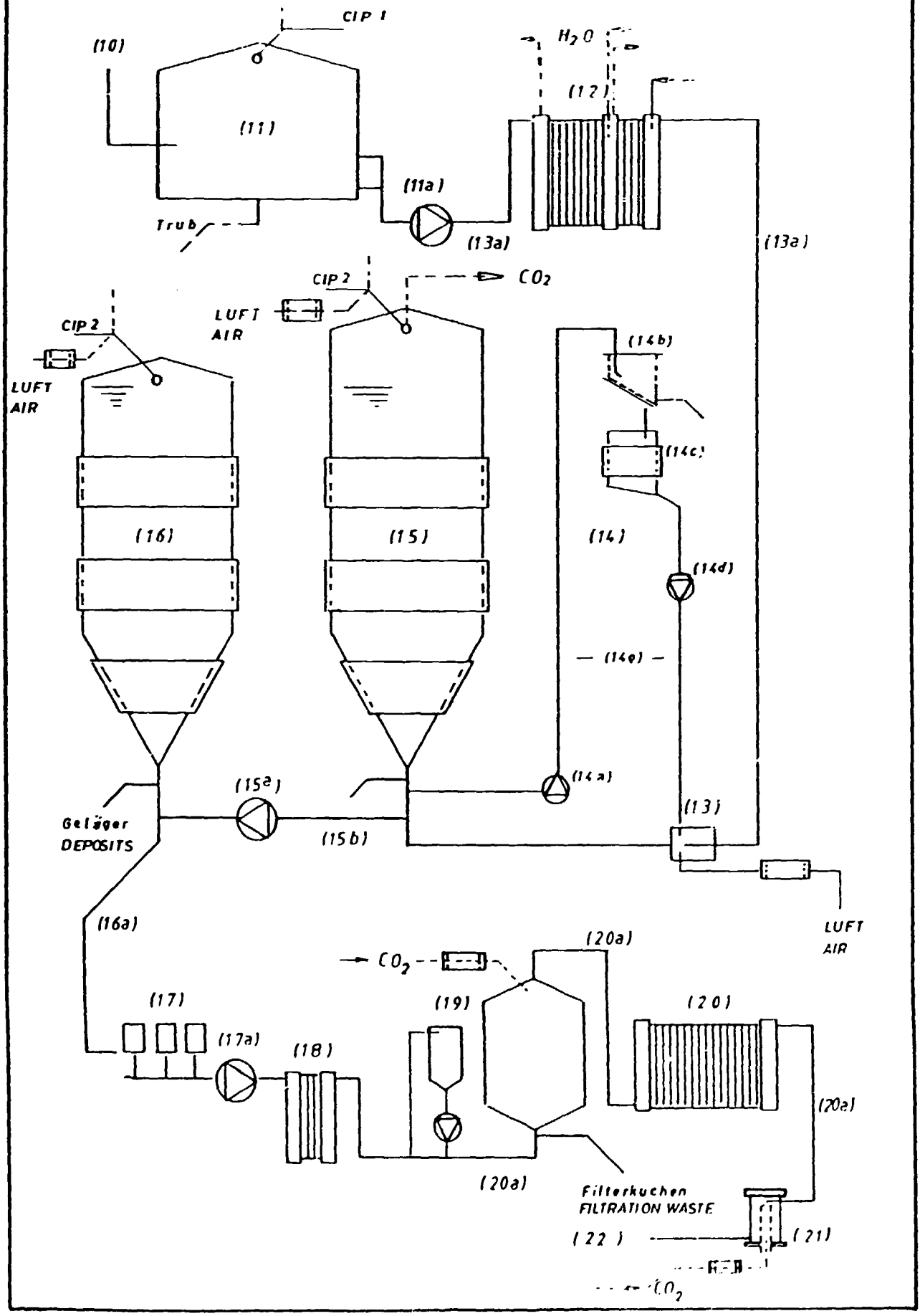
OPERATION SCHEME

BEER PRODUCTION



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OPERATION SCHEME

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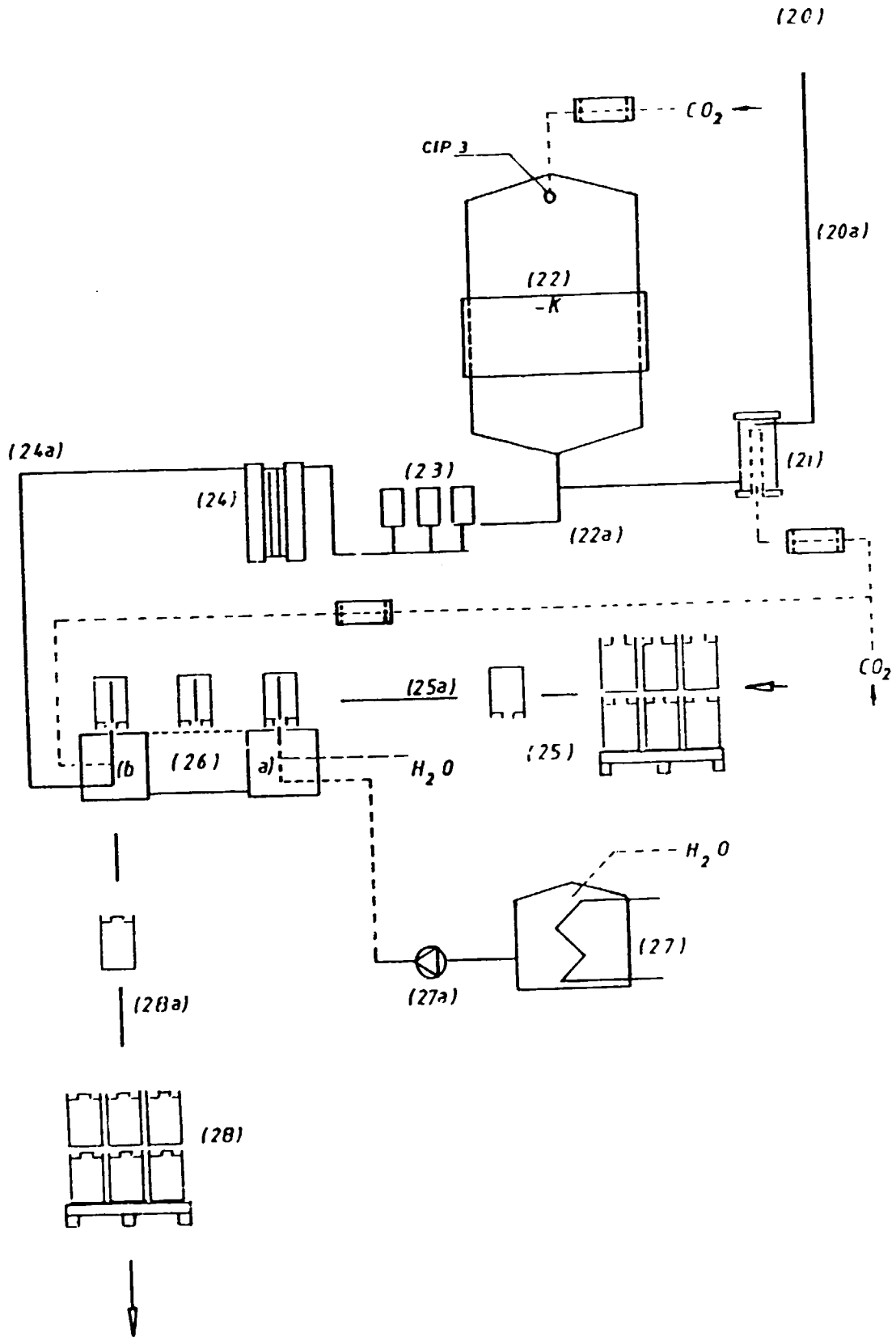

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OPERATION SCHEME

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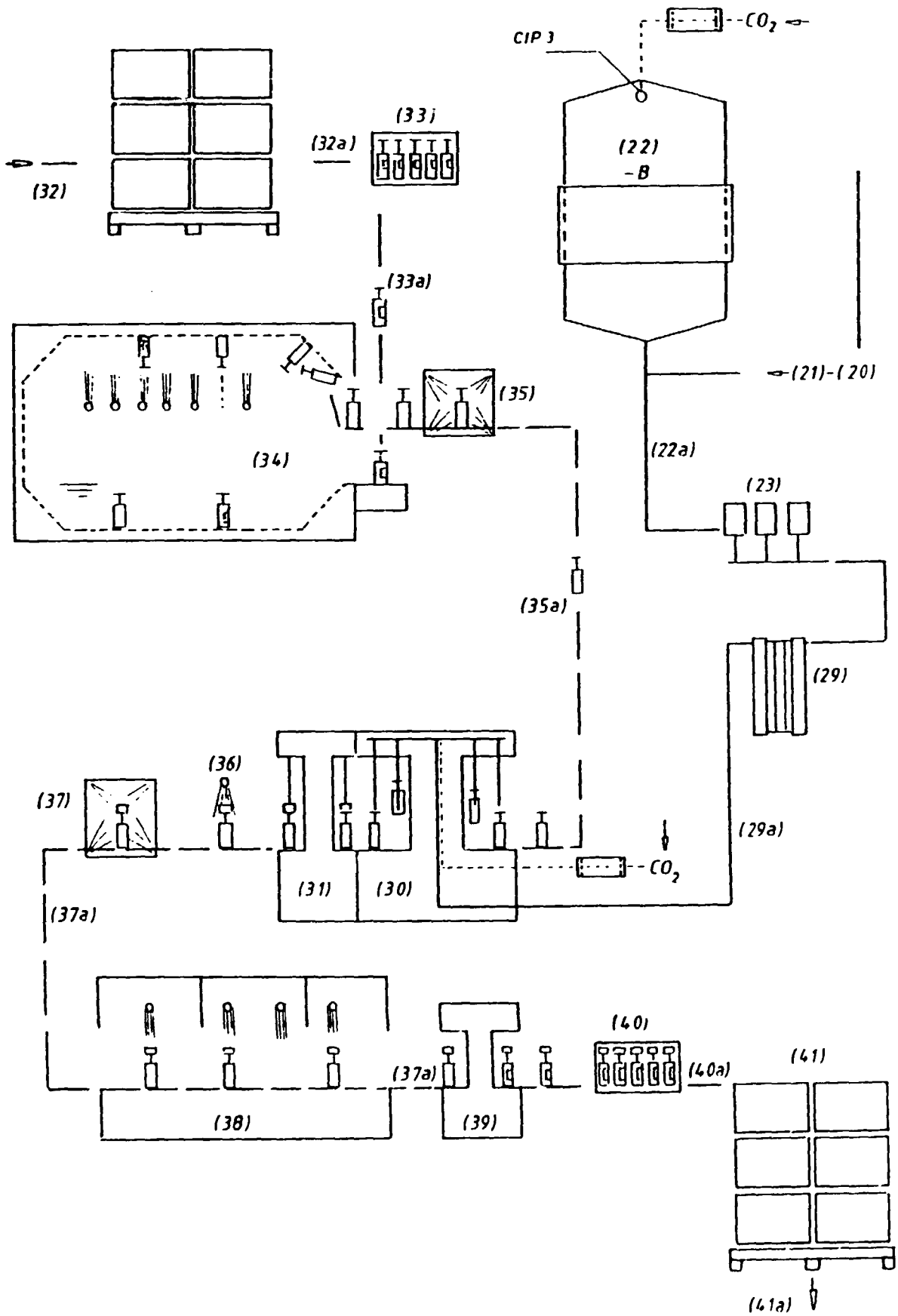

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OPERATION SCHEME

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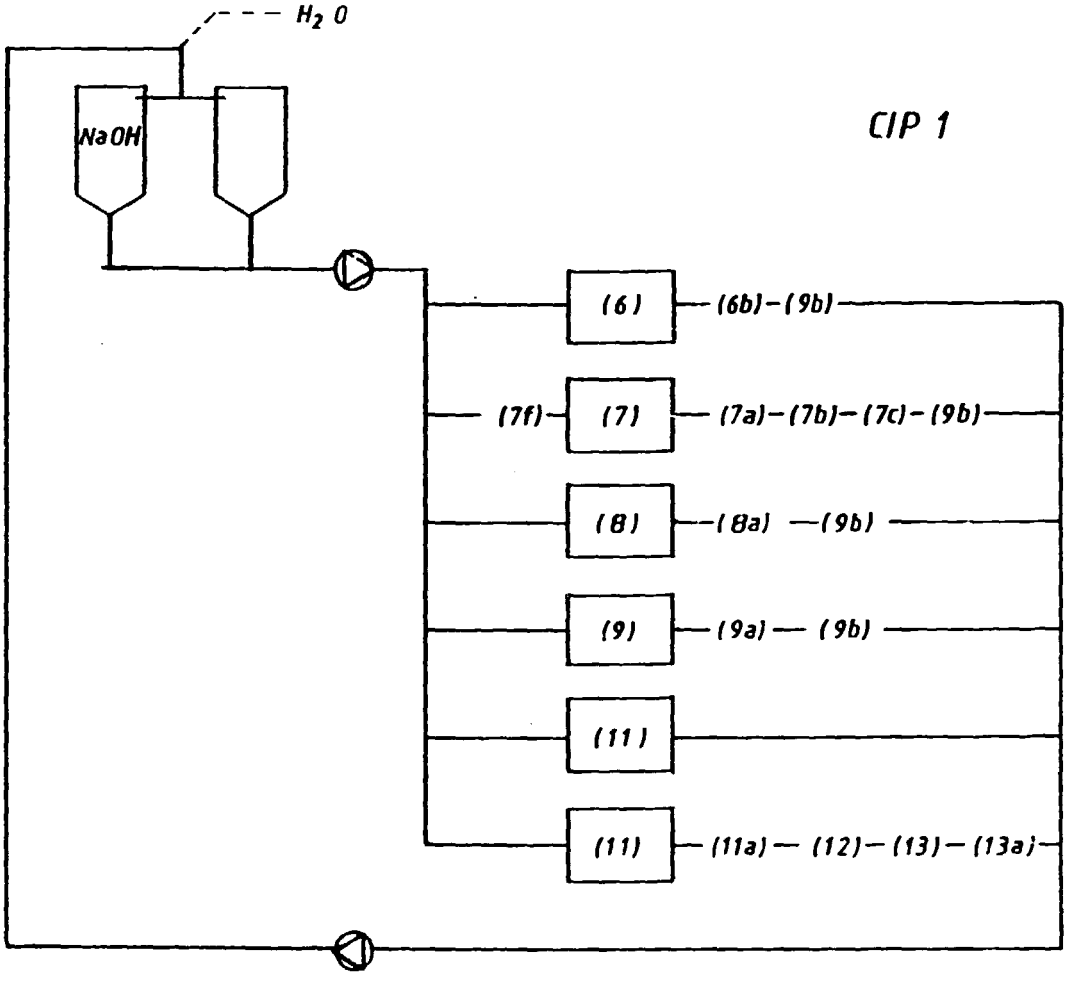
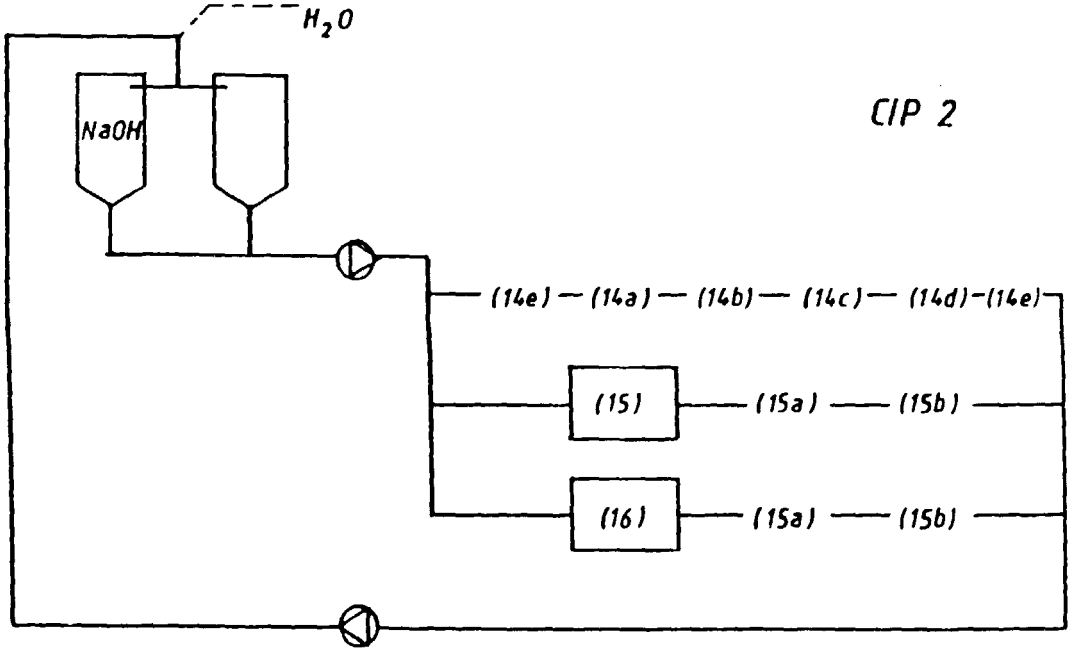
OPERATION SCHEME

CIP 1 + 2





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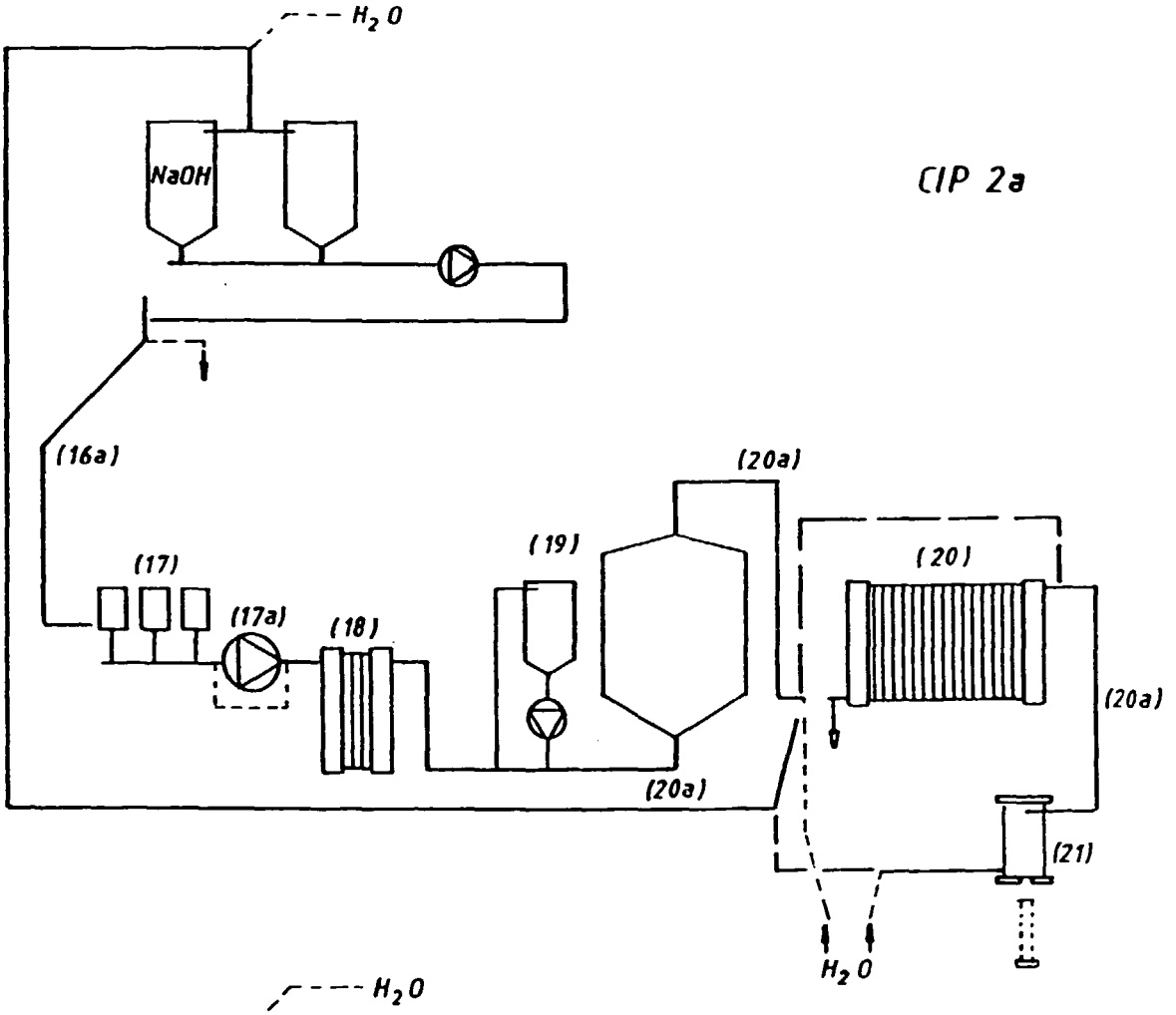
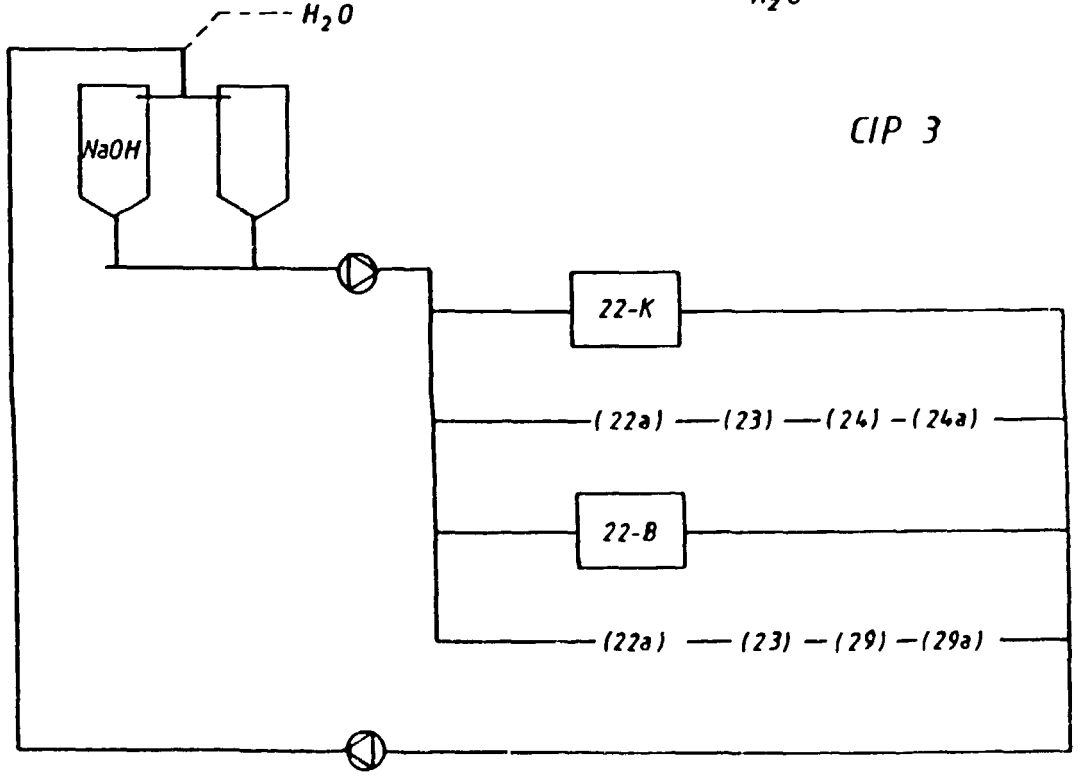
CIP 2a + 3





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OPERATION SCHEME
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RAW WATER

BREWING LIQUOR

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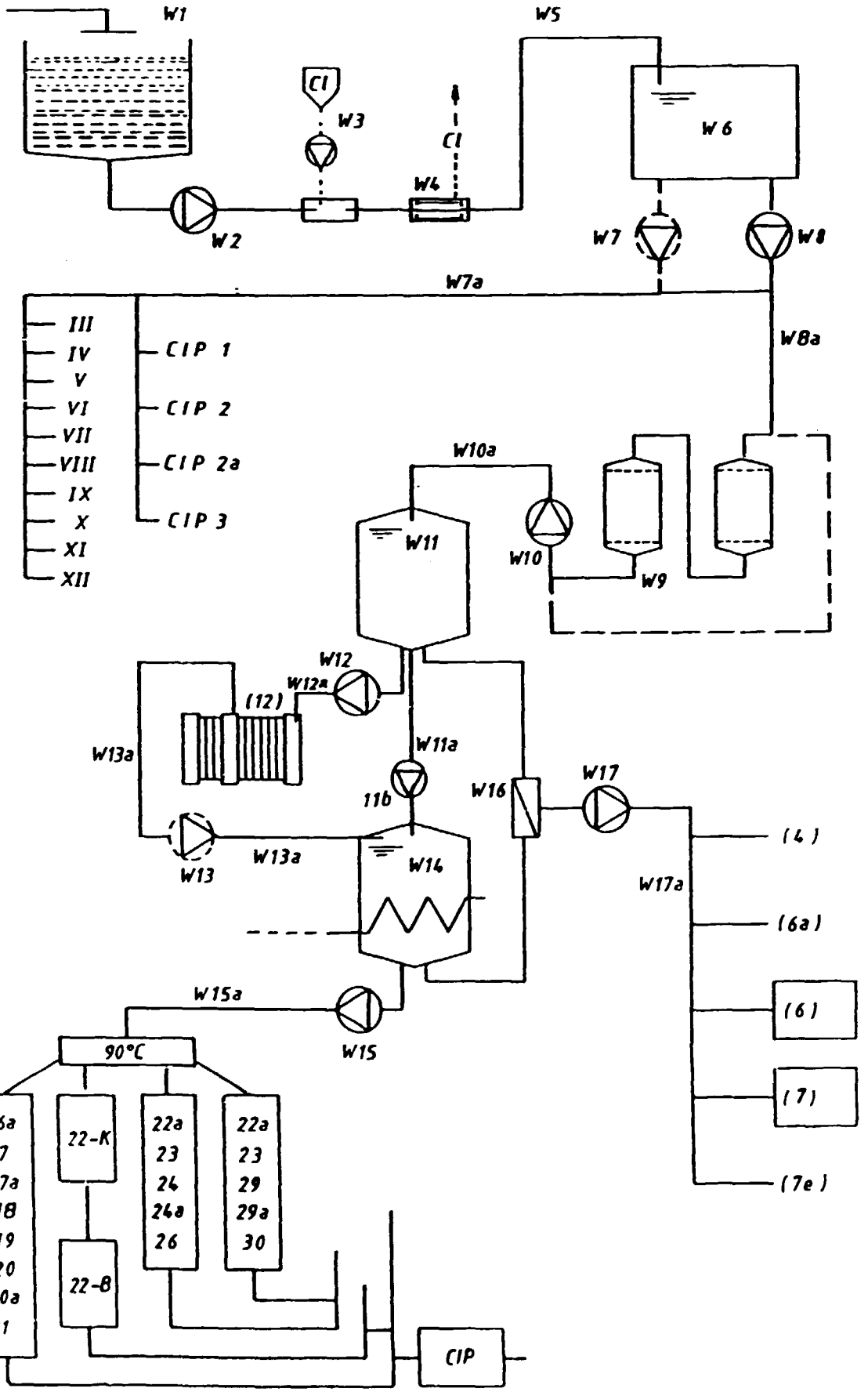
OPERATION SCHEME

WATER



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OPERATION SCHEME
CONTENTS

REFRIGERATION PLANT

K	1	Compressor
K	2	Condenser
K	3	Control Valve
K	4	Evaporator
K	5	Piping and Fittings and Control - Coolant

COOLING CONSUMPTION

12)	Wort Cooler, 2. stage
14c)	Yeast Tub
15)	Cylindroconical Fermenter
16)	Cylindroconical Storage Tank
18)	Plate Cooler
22-K	Bright Beer Tank - Kegging
22-B	Bottling Tank
29)	Plate Cooler

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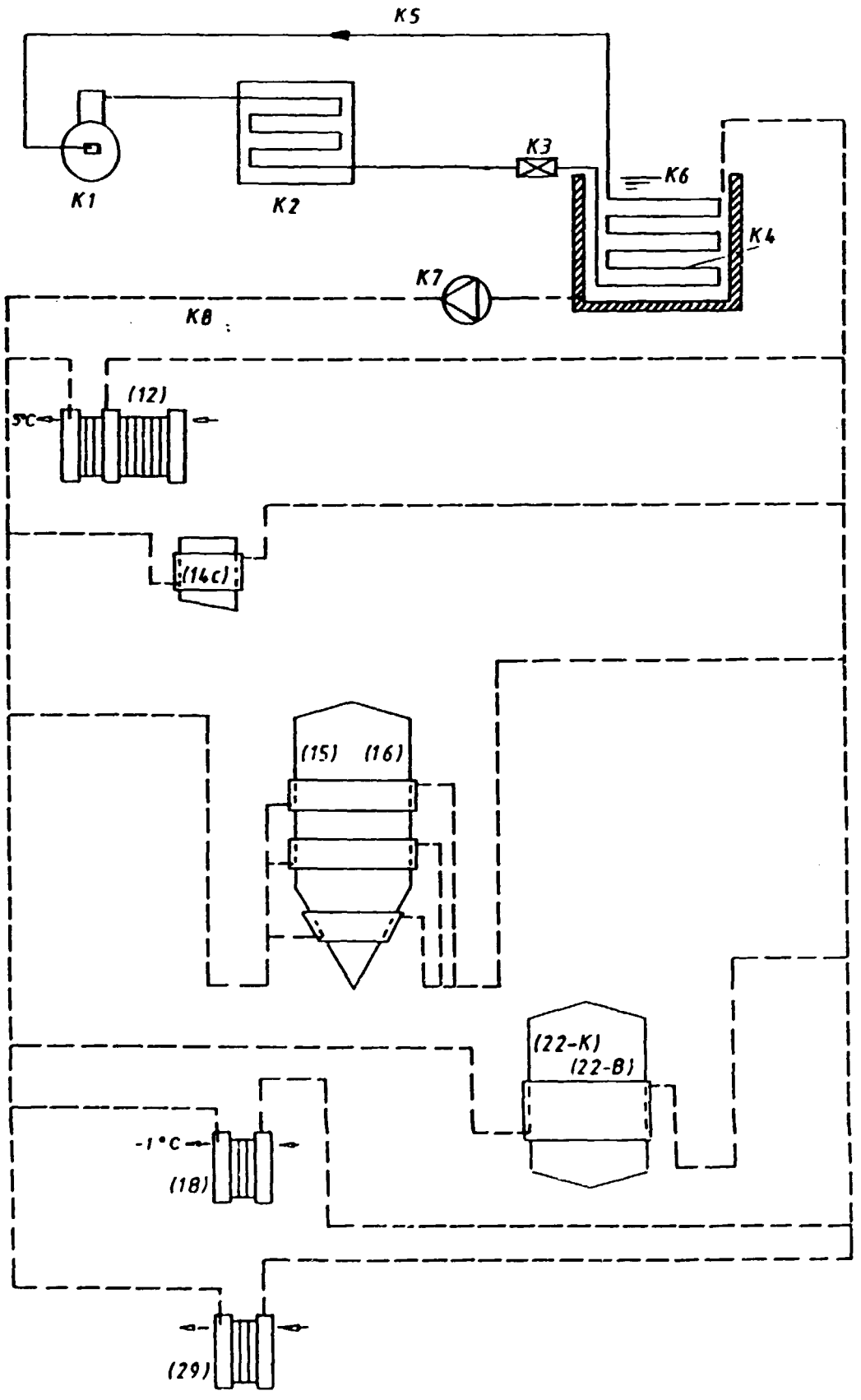
OPERATION SCHEME

COOLING SYSTEM



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OPERATION SCHEME
CONTENTS

CARBON DIOXIDE COLLECTION

15) Cylindroconical Fermenter

CARBON DIOXIDE COLLECTION PLANT

C 1 Foamtrap
C 2 Safety Relief Valve
C 3 Booster Compressor
C 4 Gas Scrubber
C 5 Gas Purifier
C 6 CO_2 Compressor
C 7 Gas Precooler
C 8 Gas Dryer
C 9 CO_2 Liquefier
C 10 Refrigeration System
C 11 CO_2 Liquid Storage Tank
C 12 Vaporizer
C 13 CO_2 Vapor Storage
C 14 Liquid CO_2 Pump
C 15 Cylinder Filling Unit with Scale
C 16 Revert CO_2 Gas Pipes
C 17 Dry Ice Press

CARBON DIOXIDE CONSUMPTION

19) Coarse filtration (Pressure Leaf or Candle f.)
21) Carbonating Apparatus
22-K Bright Beer Tank - Kegging
22-B Bottling Tank
26) Kegging
30) Bottling

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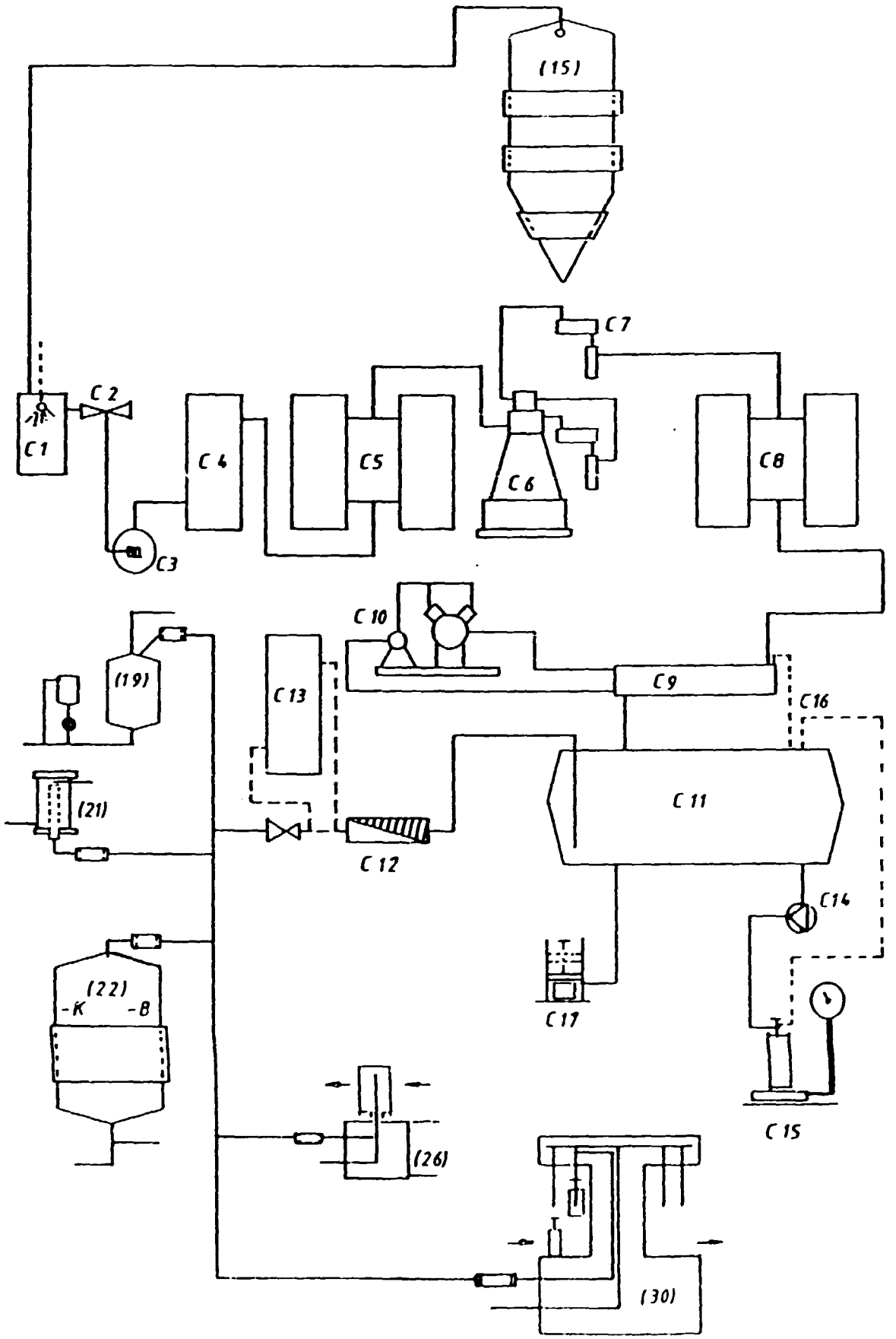
OPERATION SCHEME

CARBONDIOXIDE CO_2



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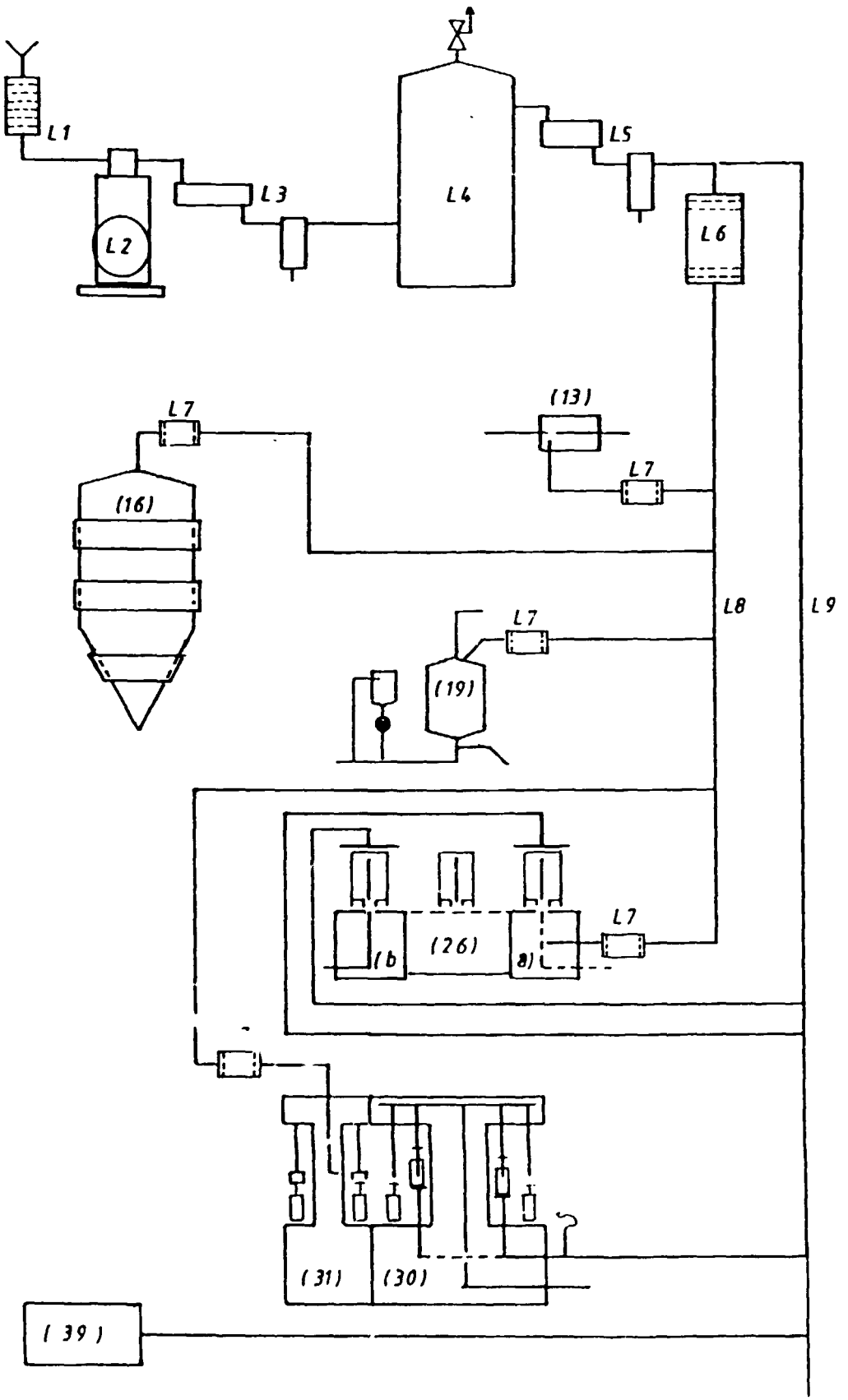
OPERATION SCHEME

AIR



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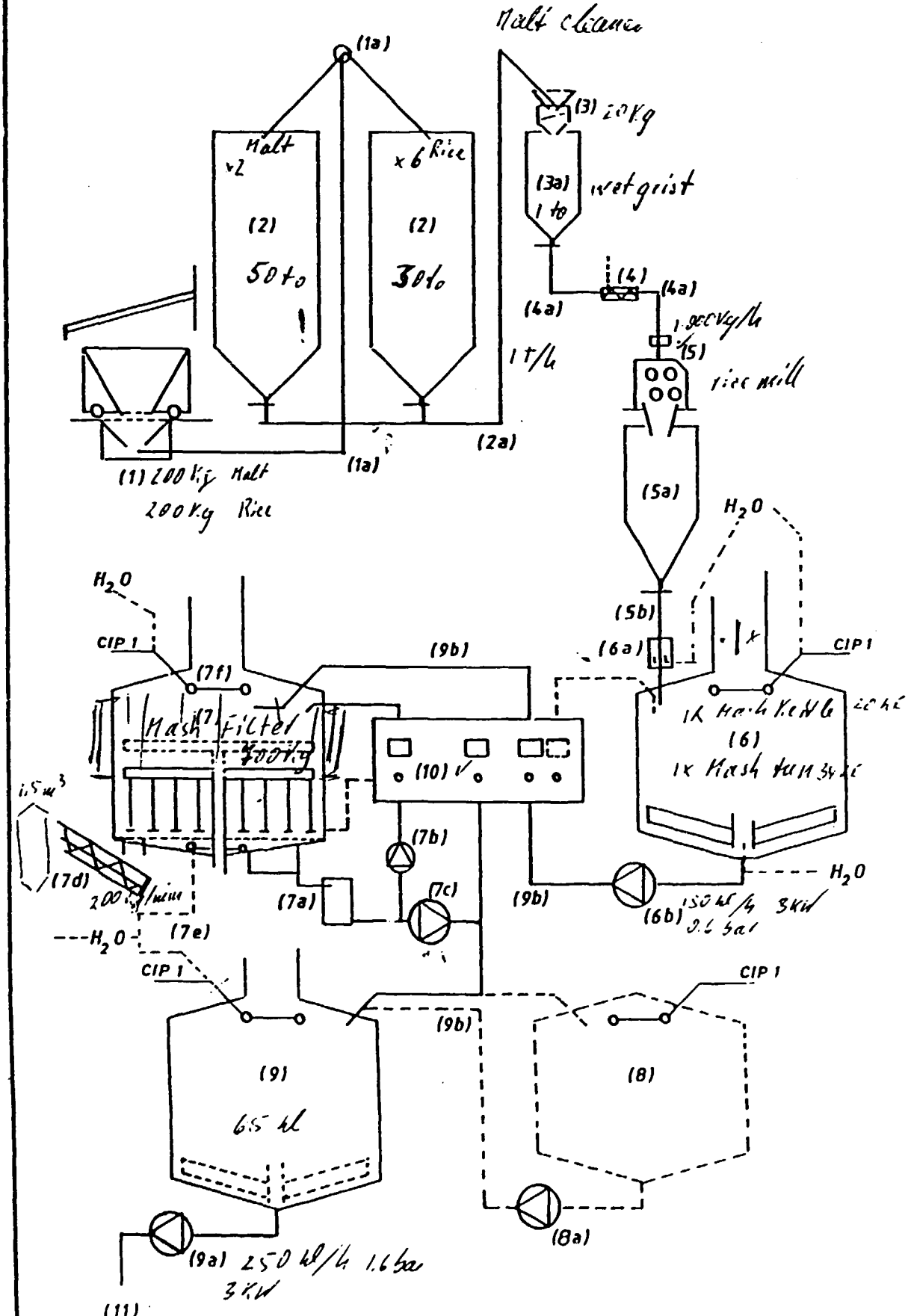
OPERATION SCHEME

WORT PRODUCTION 1. LIEUSHUIS



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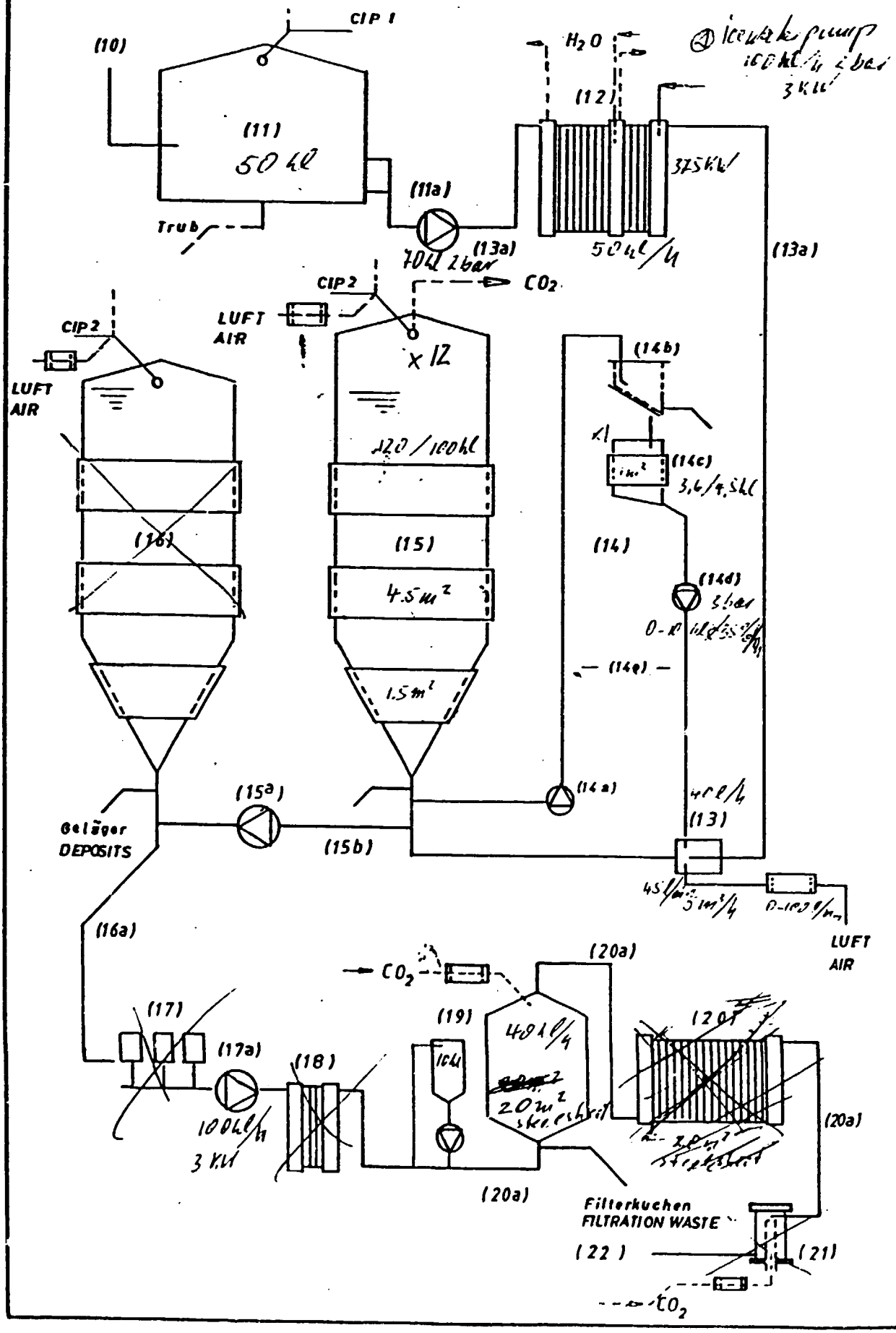

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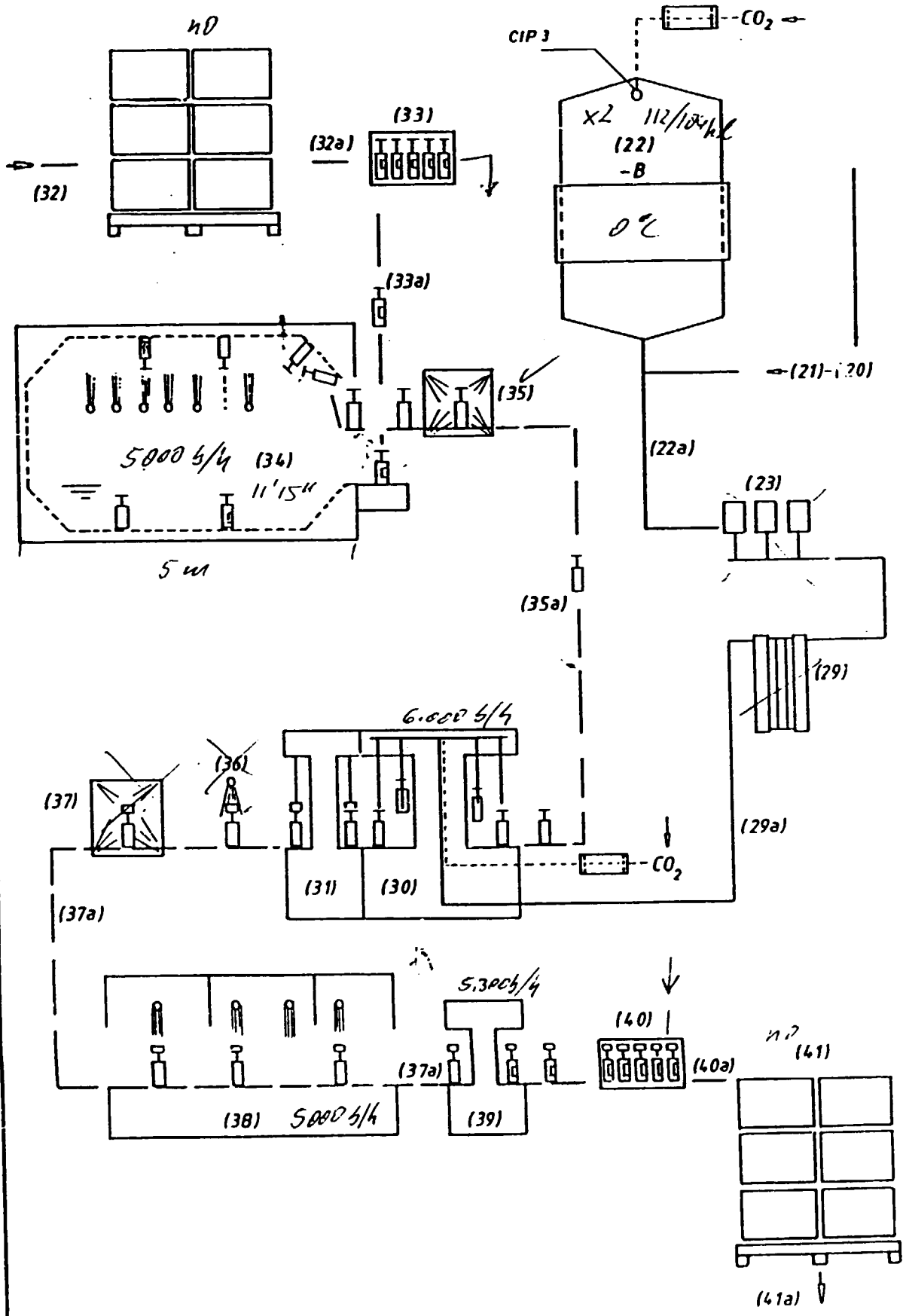
OPERATION SCHEME

BOTTLING 1. LEUSHUIS



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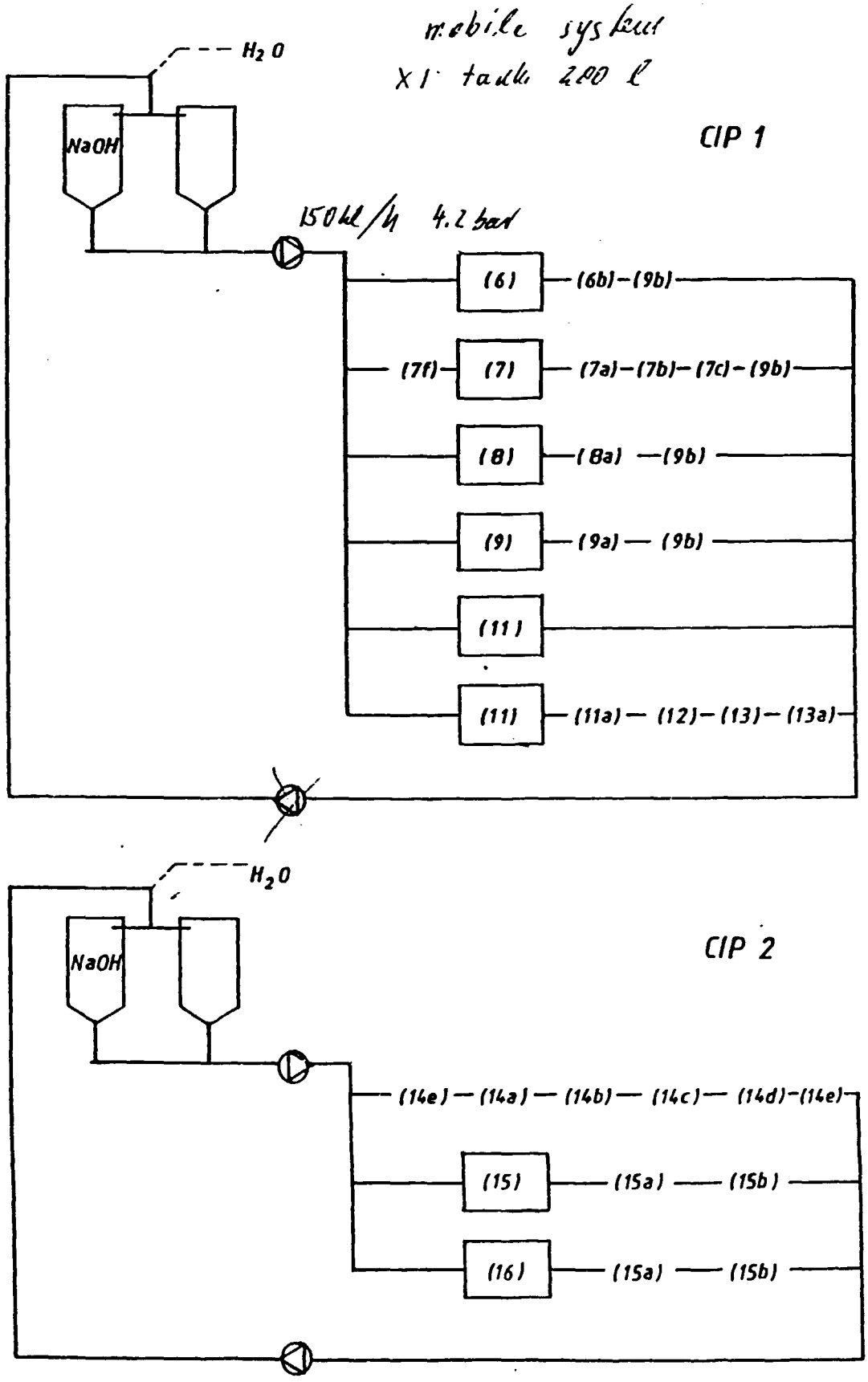
OPERATION SCHEME

CIP 1 + 2 — 1. Leitschi's



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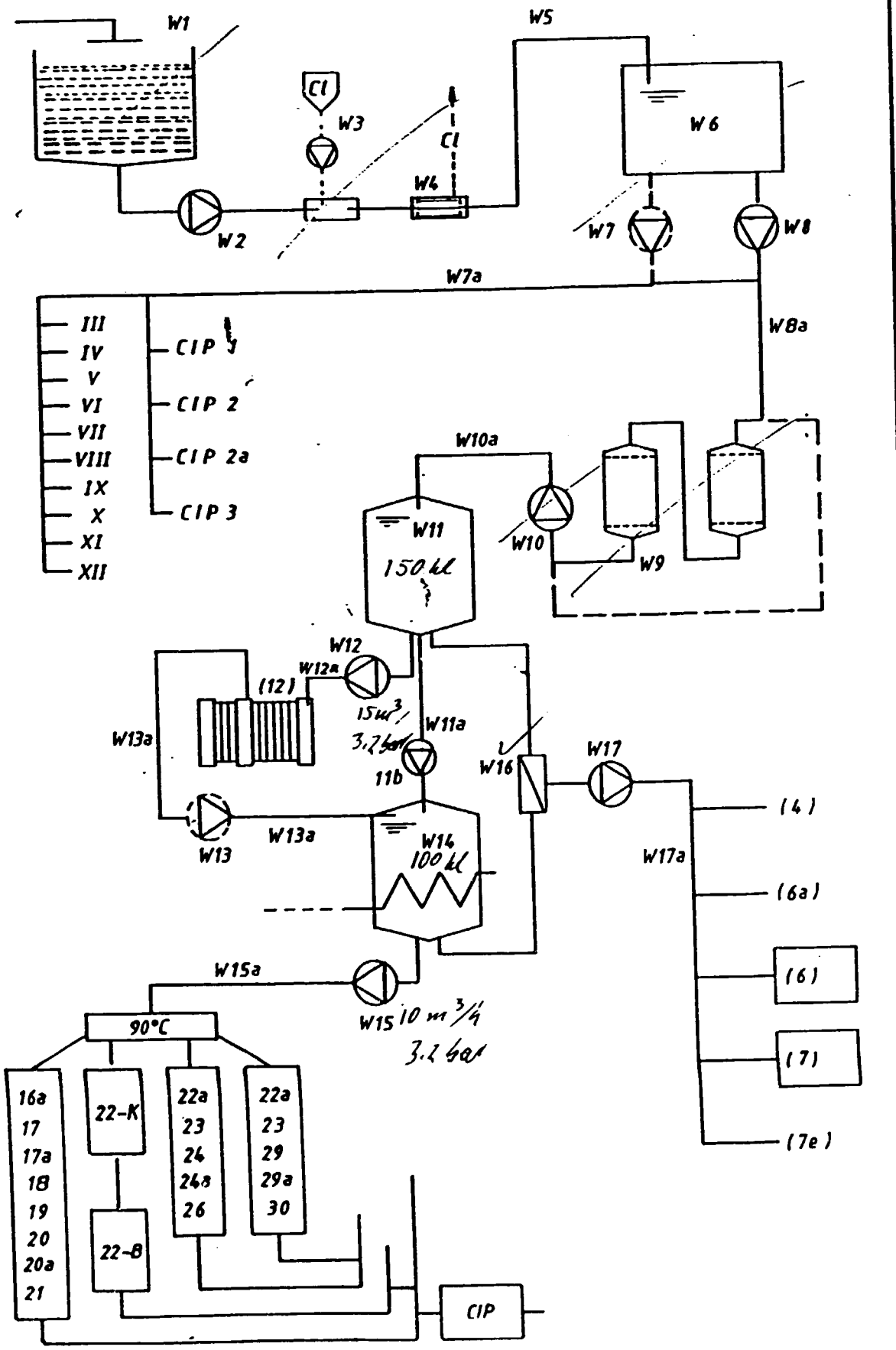
OPERATION SCHEME

WATER 1. LEUSHUIS



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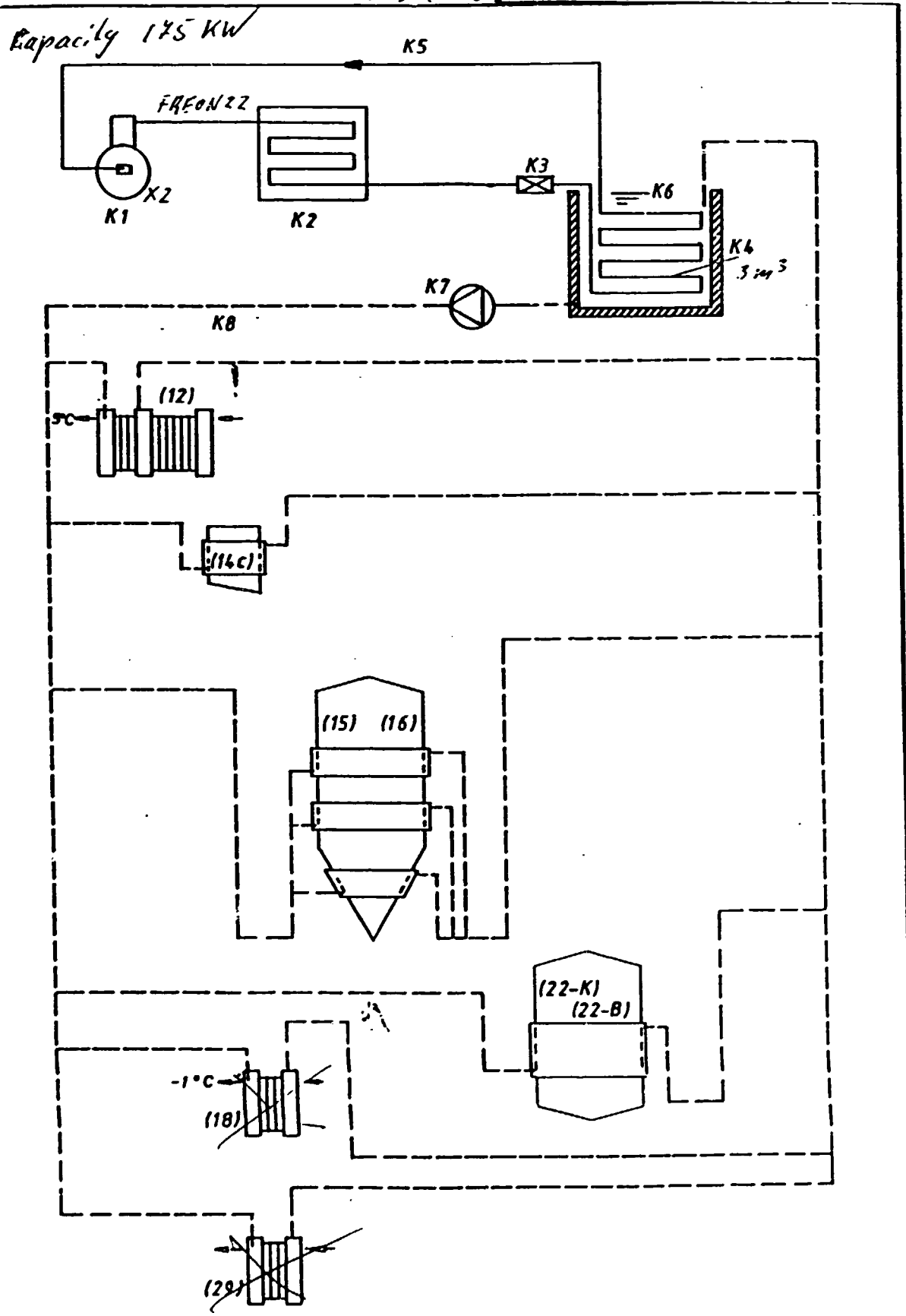
OPERATION SCHEME

COOLING SYSTEM 1. LEU SHUIS



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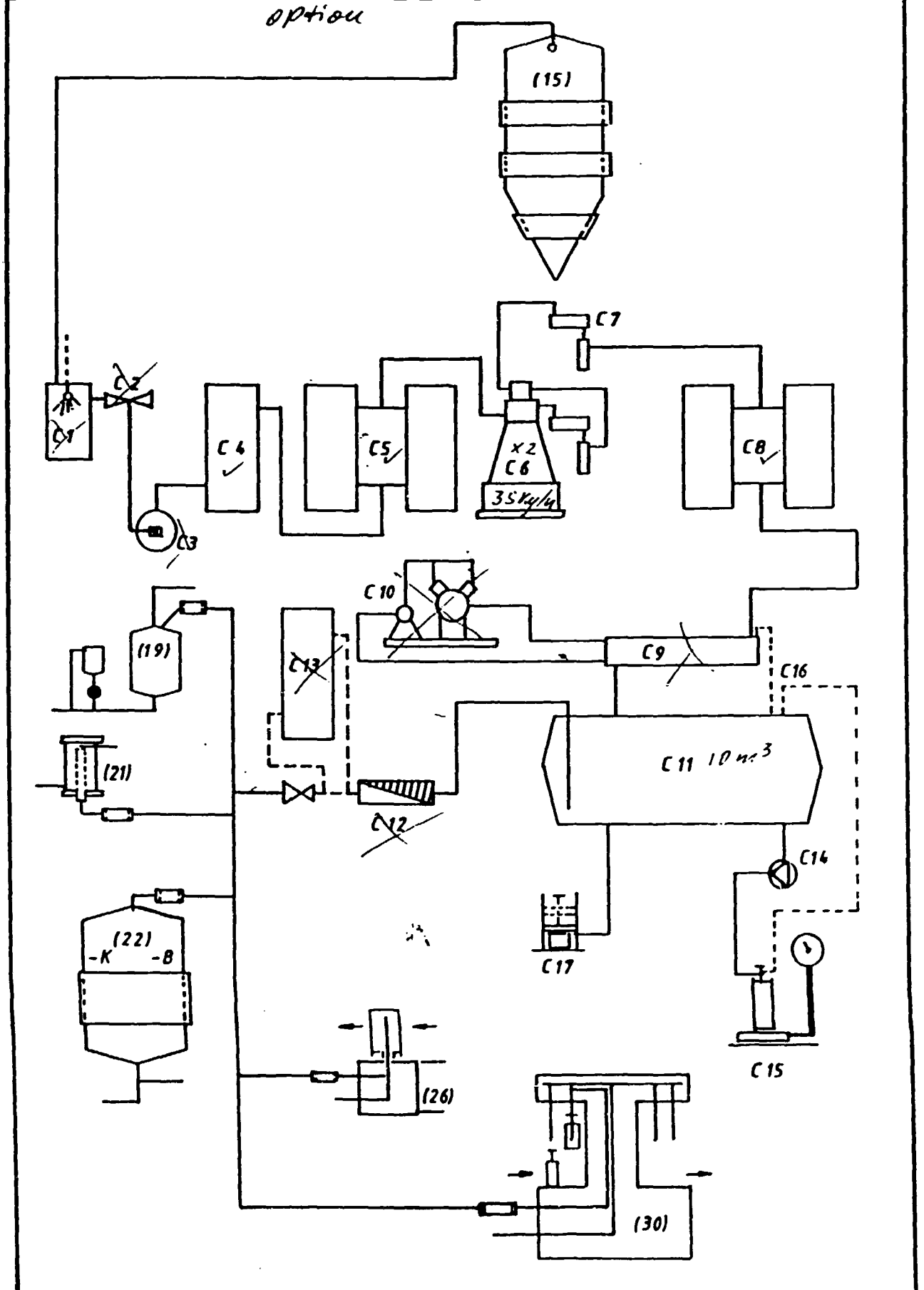
OPERATION SCHEME

CARBONDIOXIDE CO_2 1. LEUSHUIS



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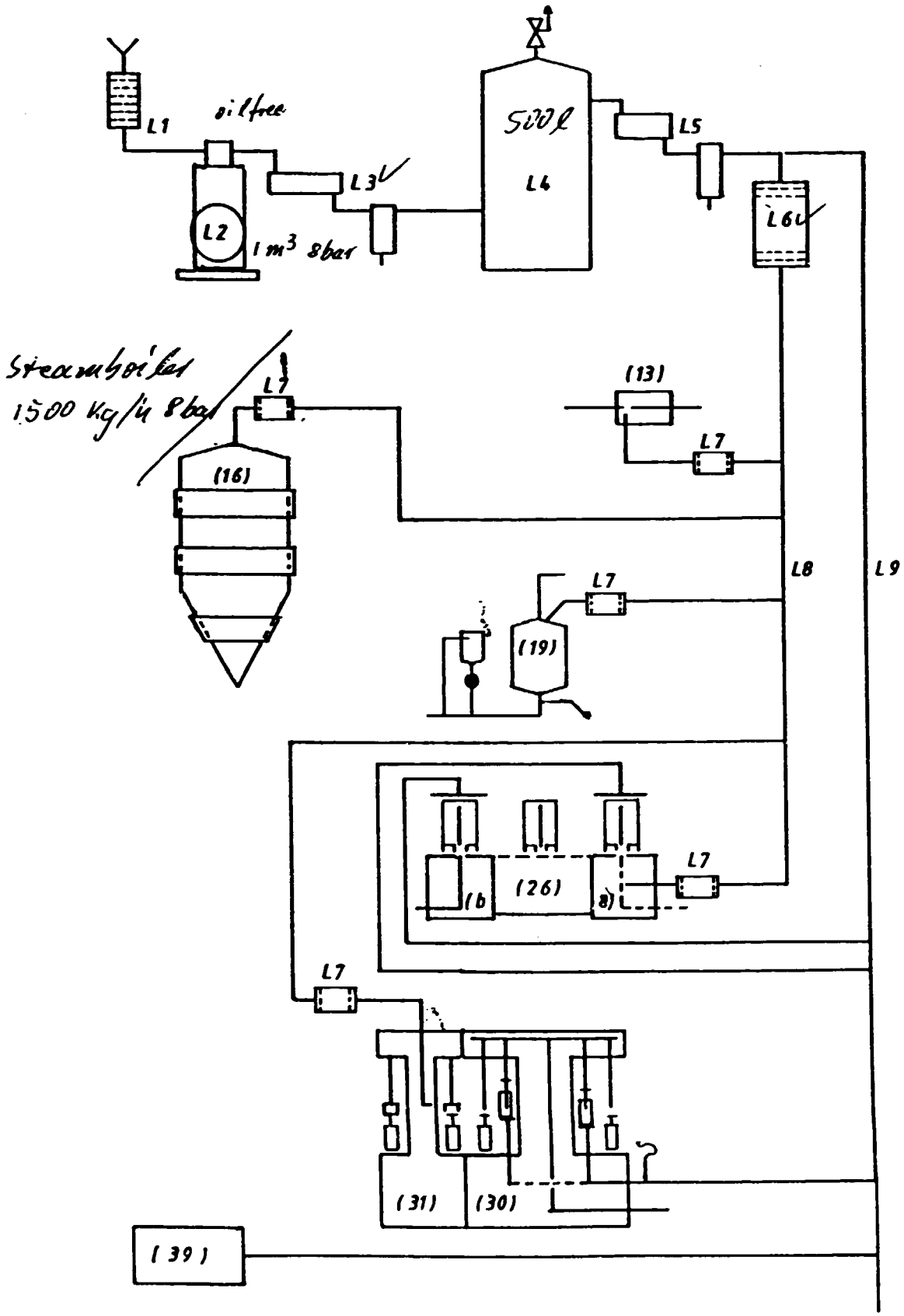
AIR 1. LEVEL



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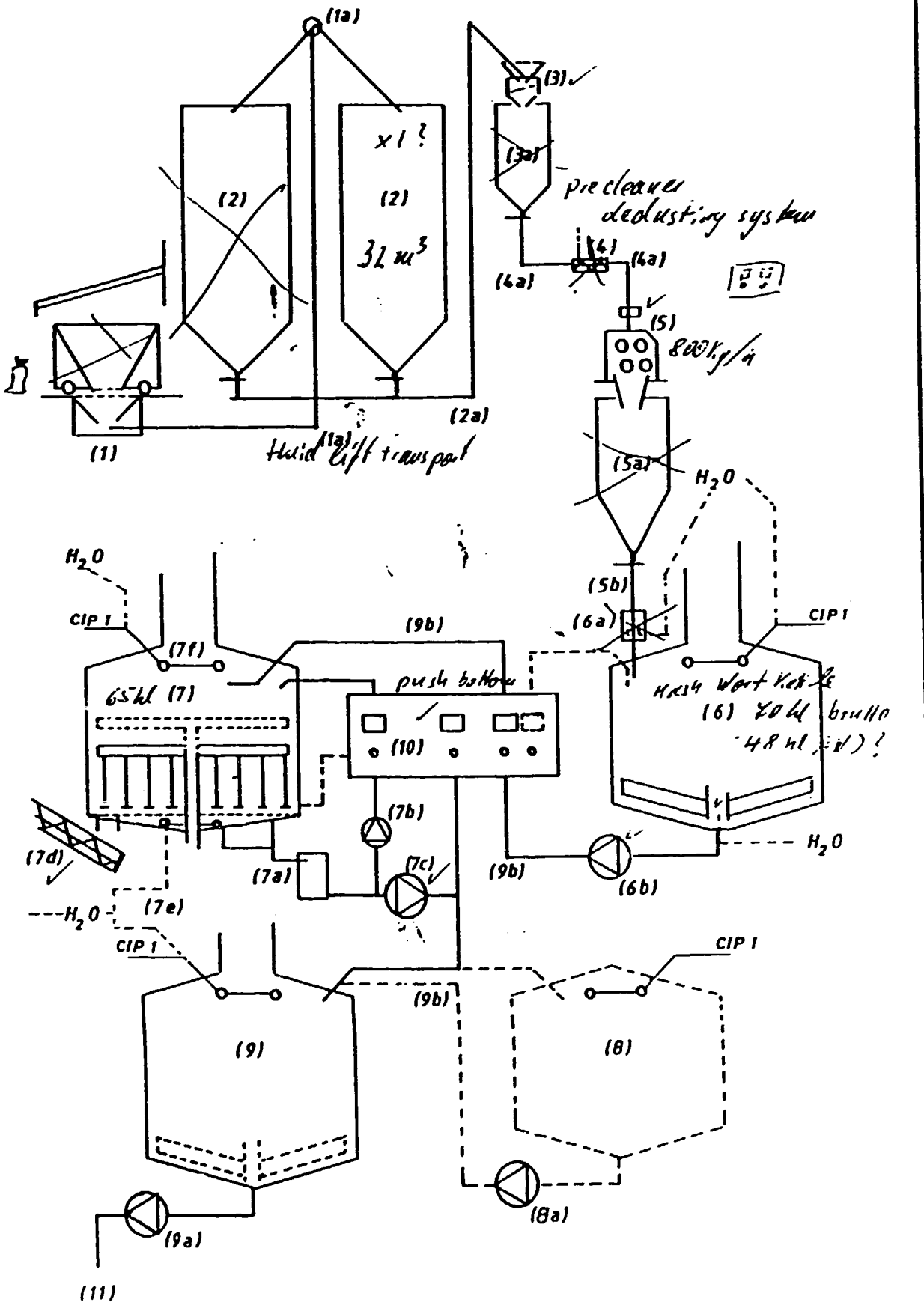
OPERATION SCHEME

WORT PRODUCTION 2. ZIANBREW



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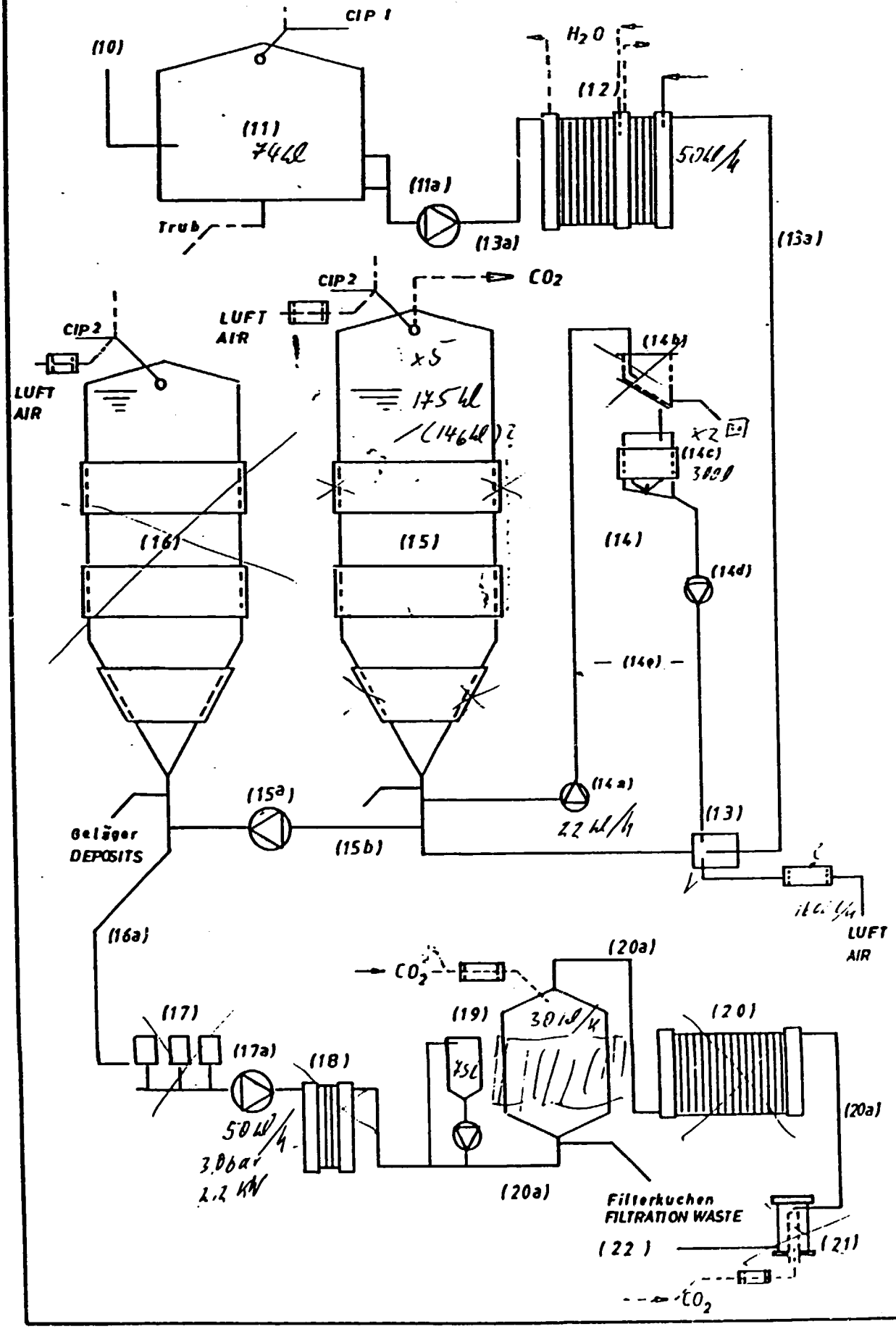
OPERATION SCHEME

BEER PRODUCTION 2. DANBREW



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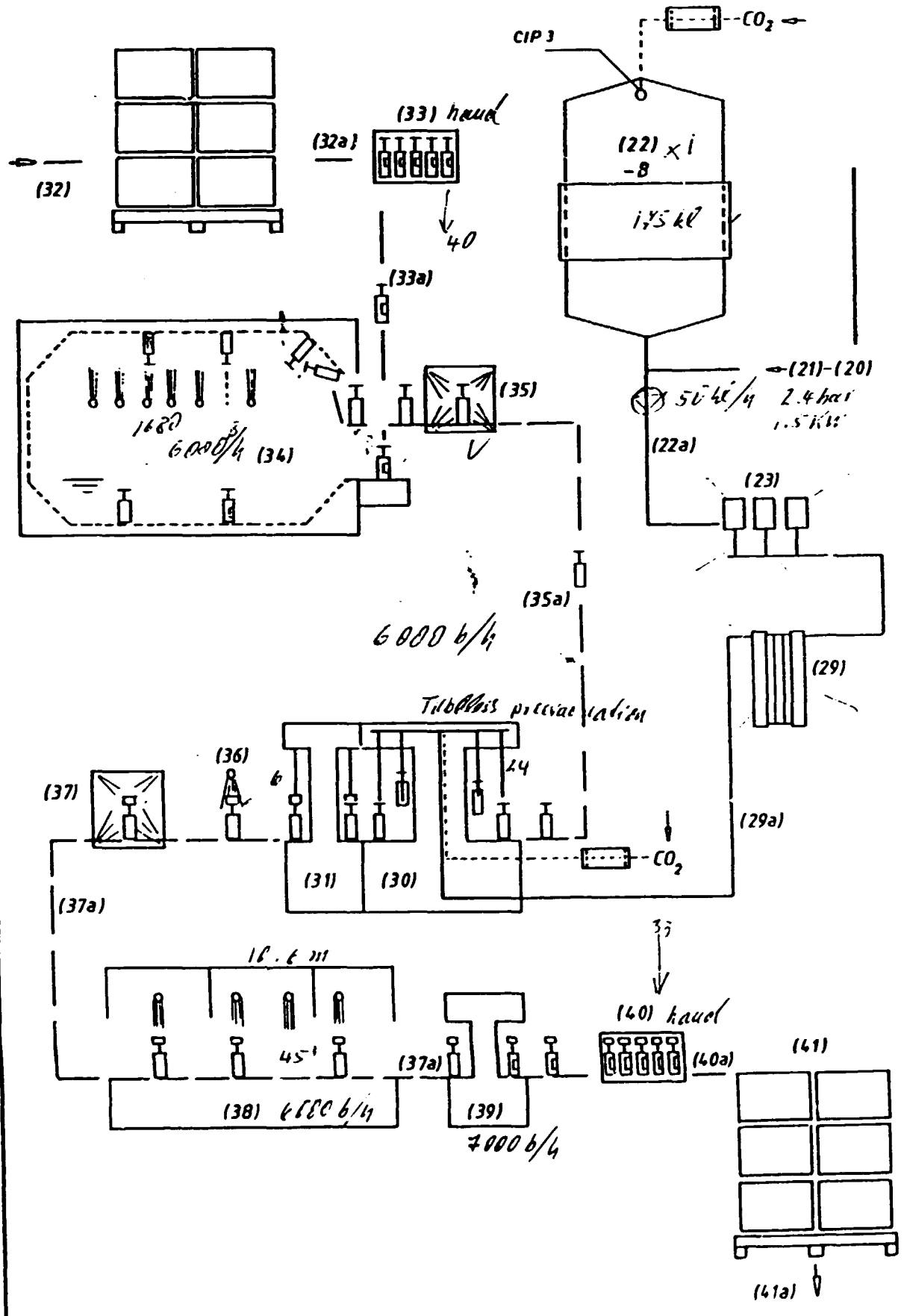
OPERATION SCHEME

BOTTLING 2. DANBREW



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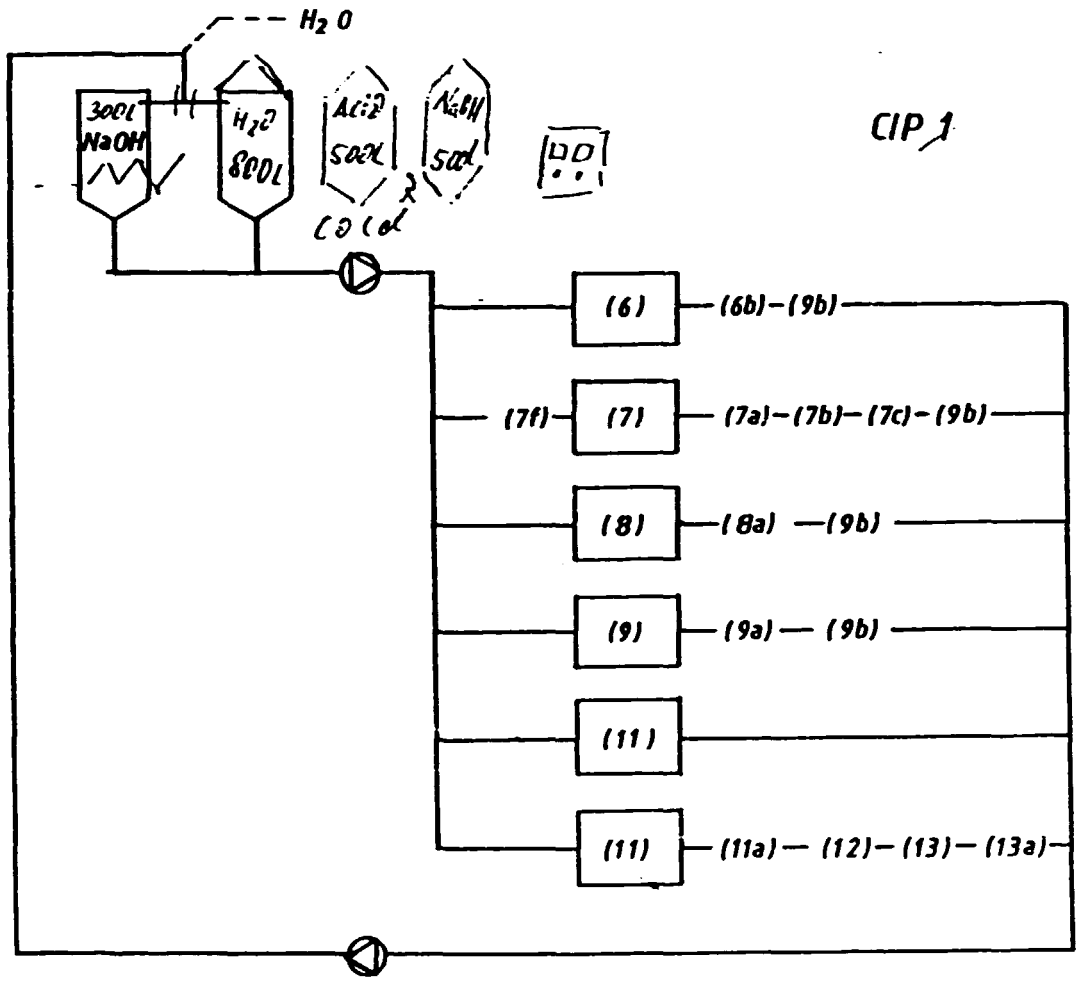
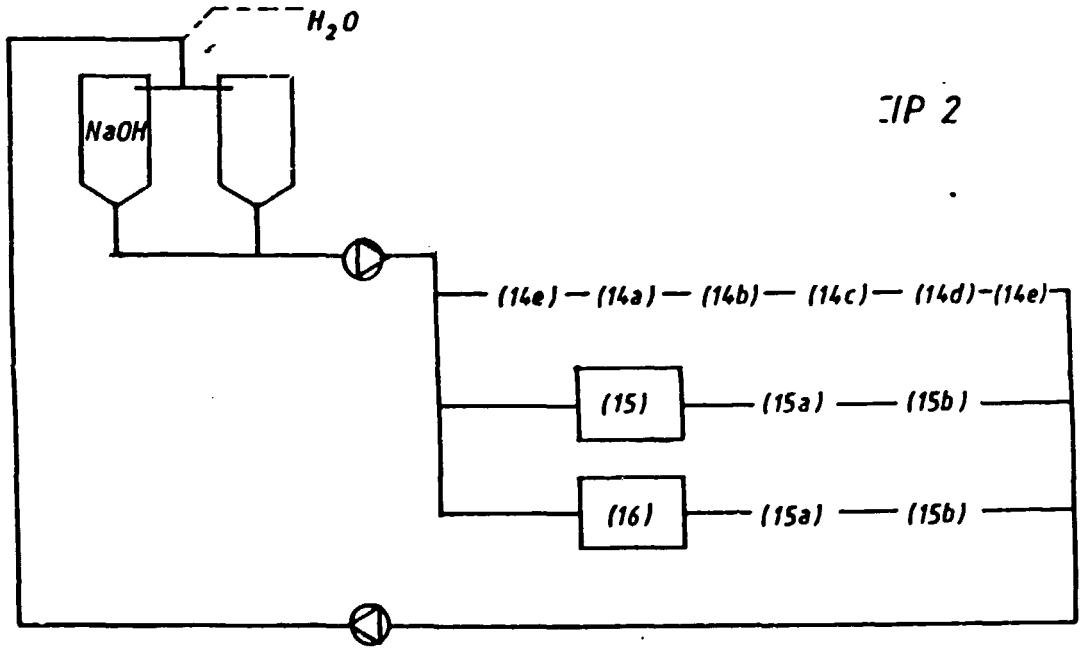
OPERATION SCHEME

CIP 1 + 2 2. DANBREW

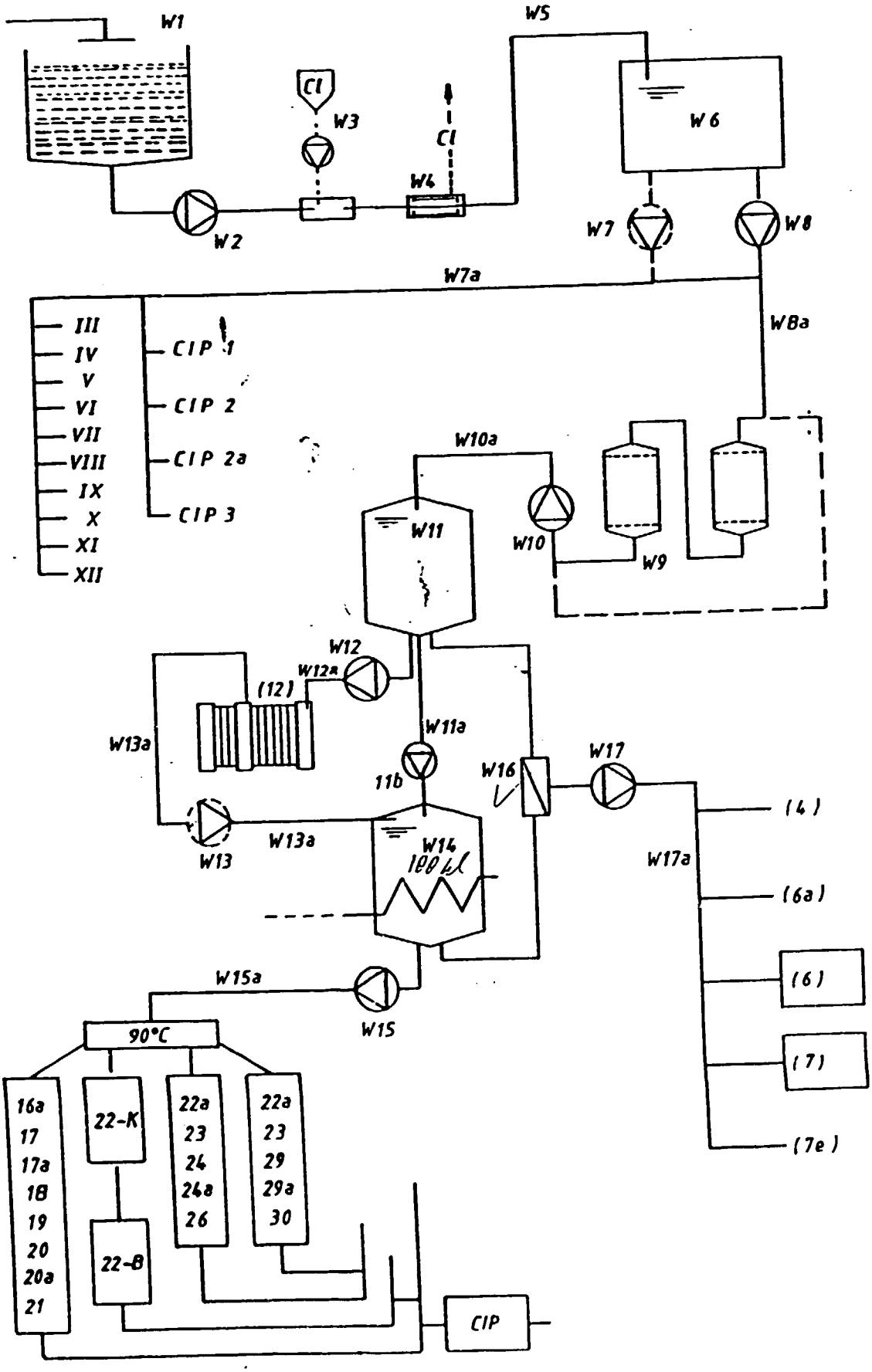




CHECK LIST BREWERY

OPERATION SCHEME

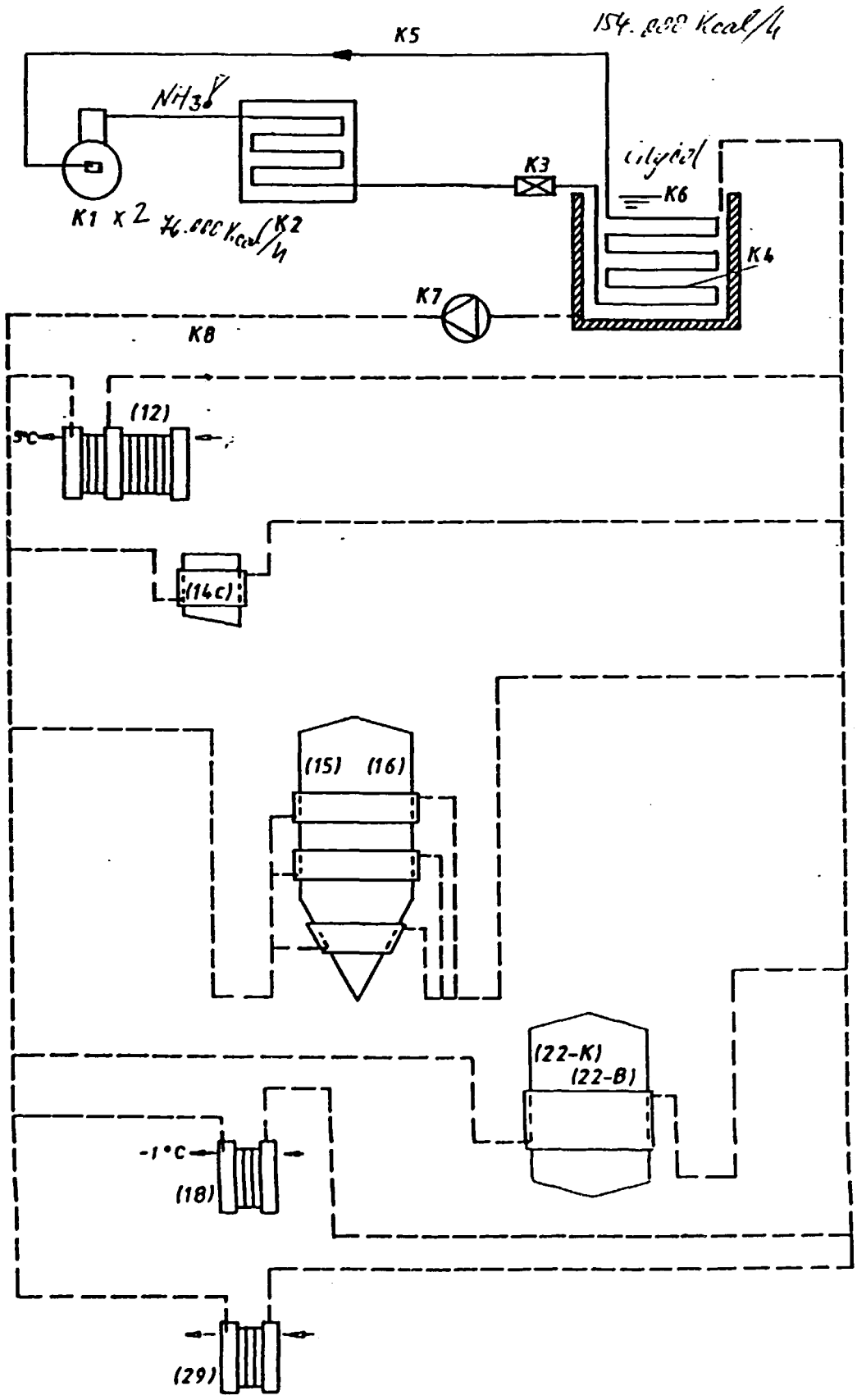
WATER 2. DANBREW



CHECK LIST BREWERY

OPERATION SCHEME

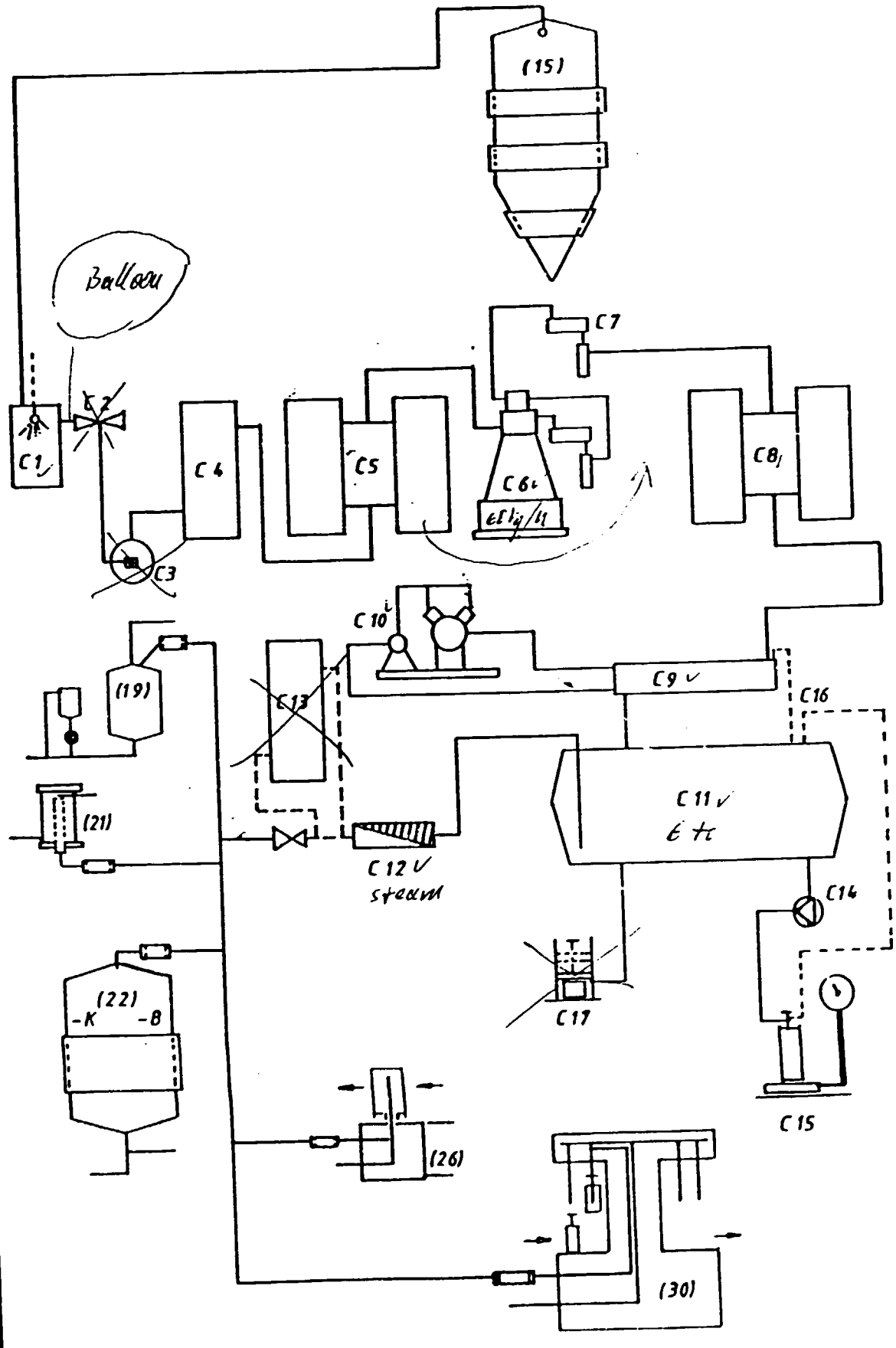
COOLING SYSTEM 2. JANBREW



CHECK LIST BREWERY

OPERATION SCHEME

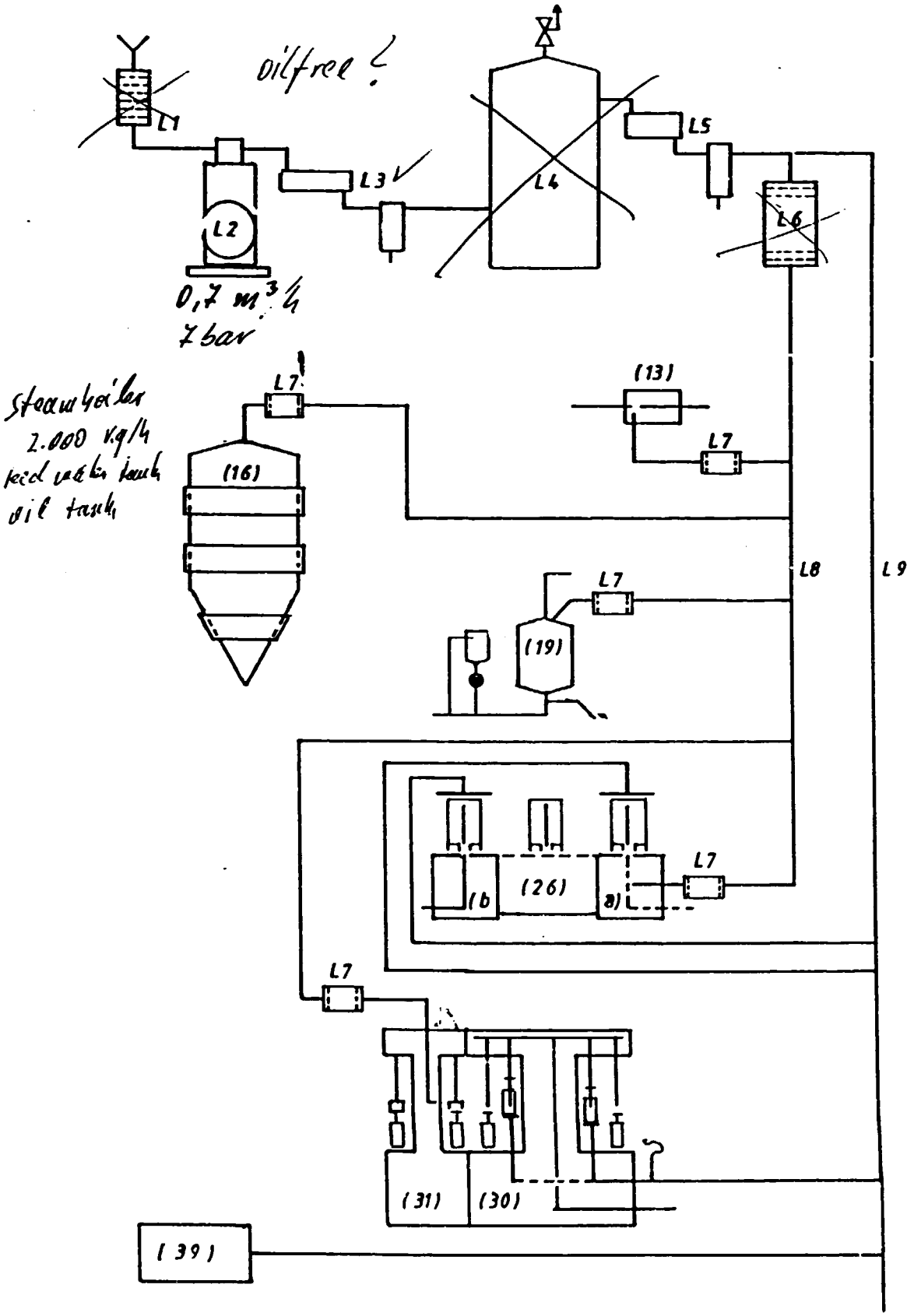
CARBONDIOXIDE CO_2 2. DANISH



LHECK LIST BREWERY

OPERATION SCHEME

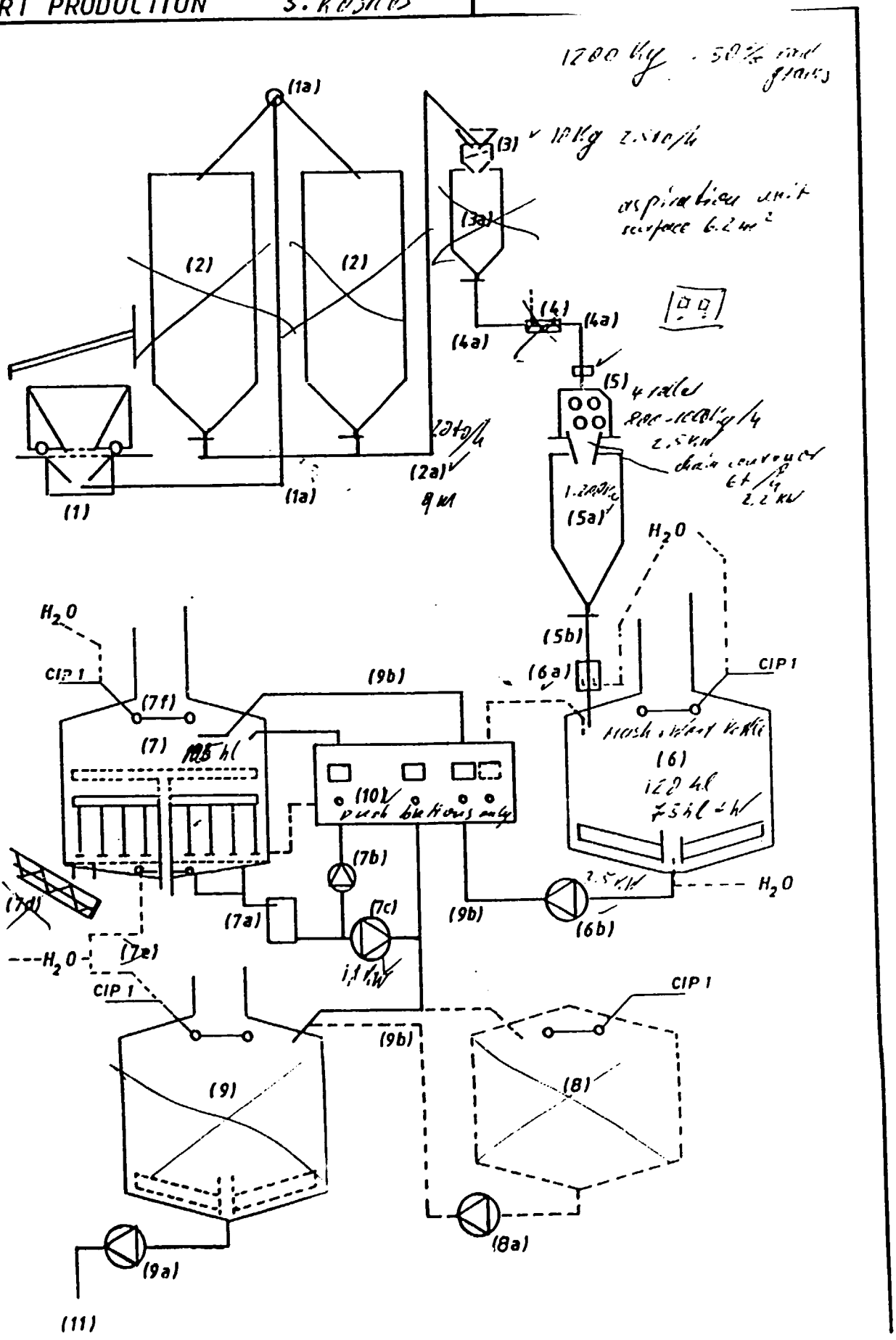
AIR 2. DANSREW



CHECK LIST BREWERY

OPERATION SCHEME

WORT PRODUCTION 3. KASKÁS

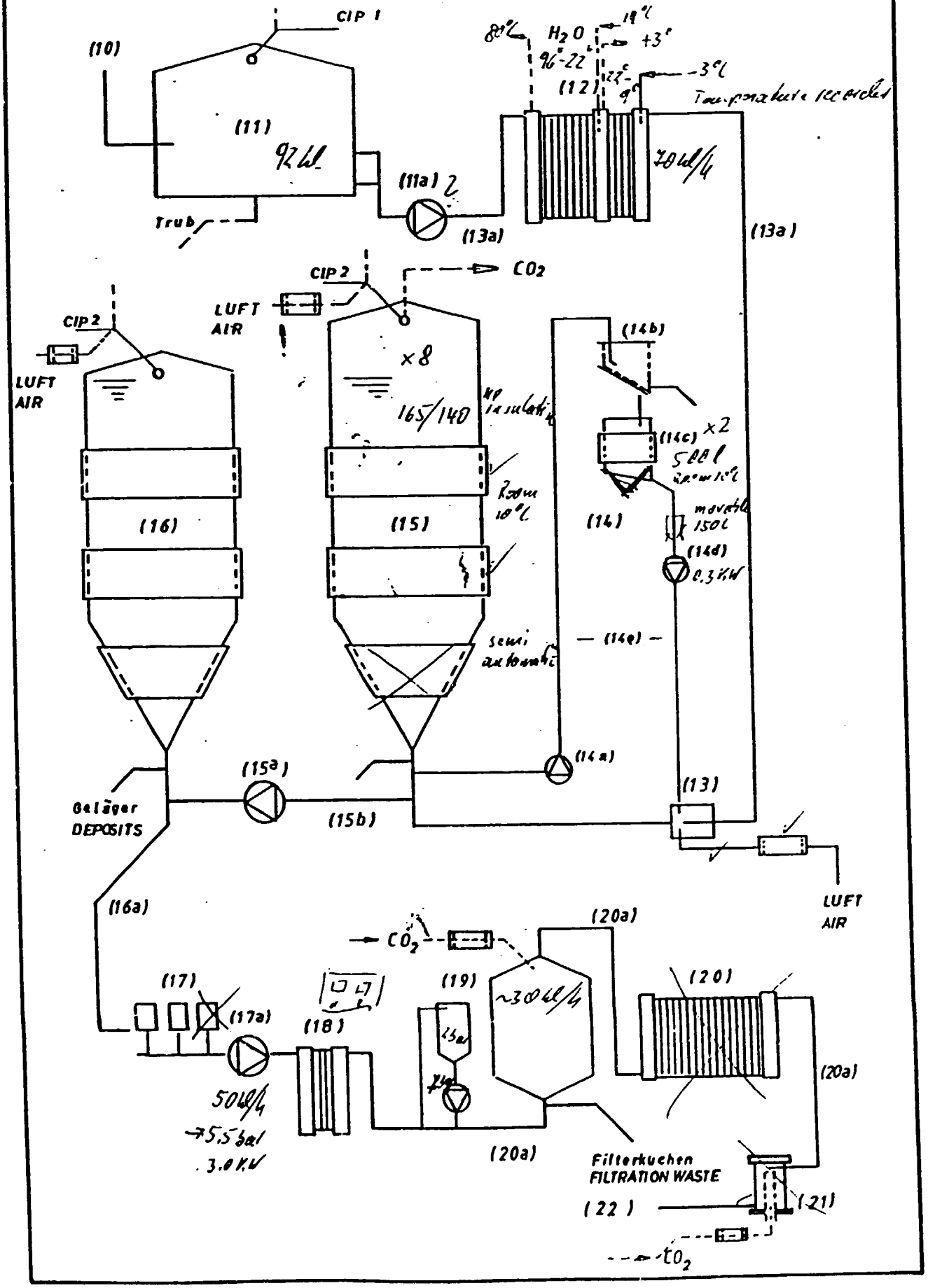


CHECK LIST BREWERY

OPERATION SCHEME

BEER PRODUCTION

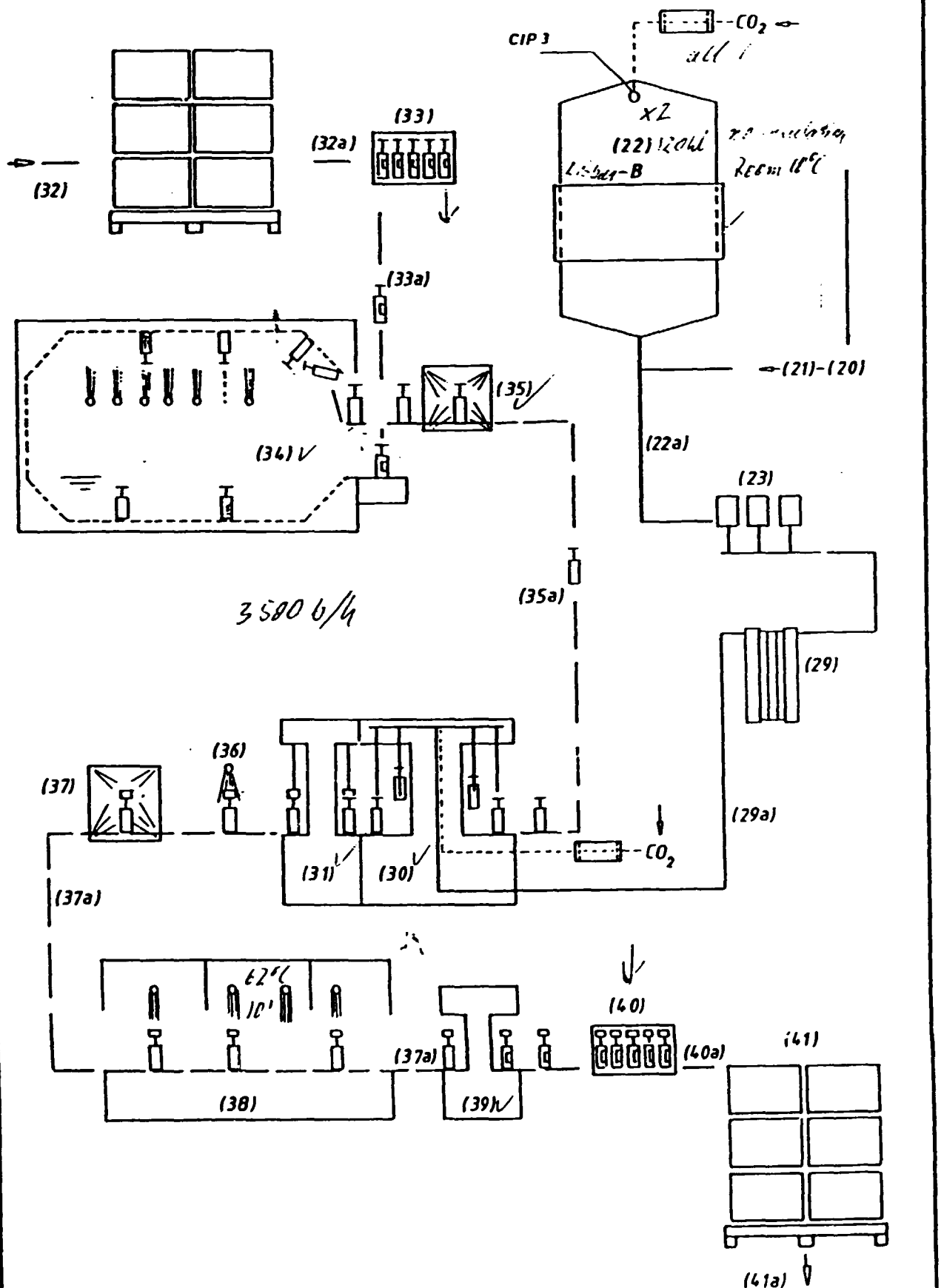
3. KOSHOS



CHECK LIST BREWERY

OPERATION SCHEME

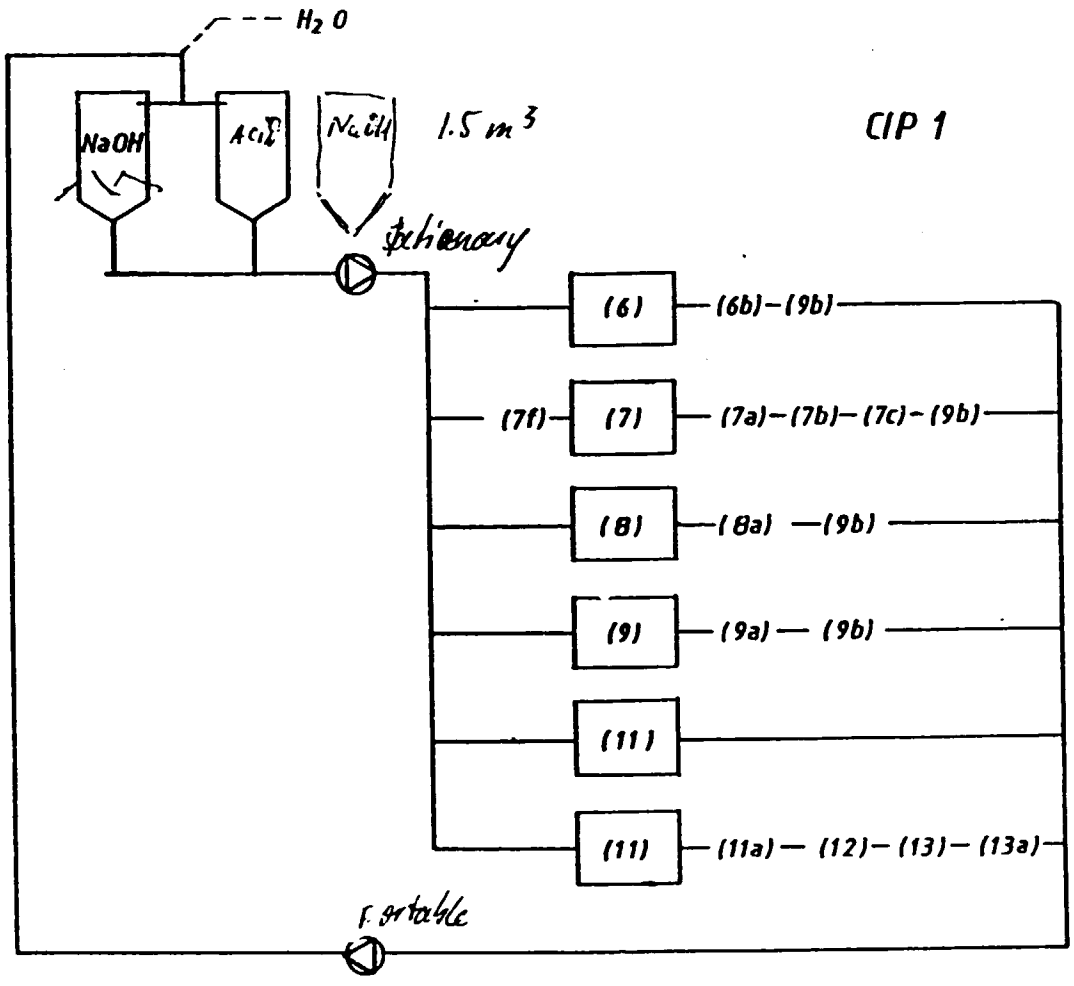
BOTTLING 3. KOSMOS

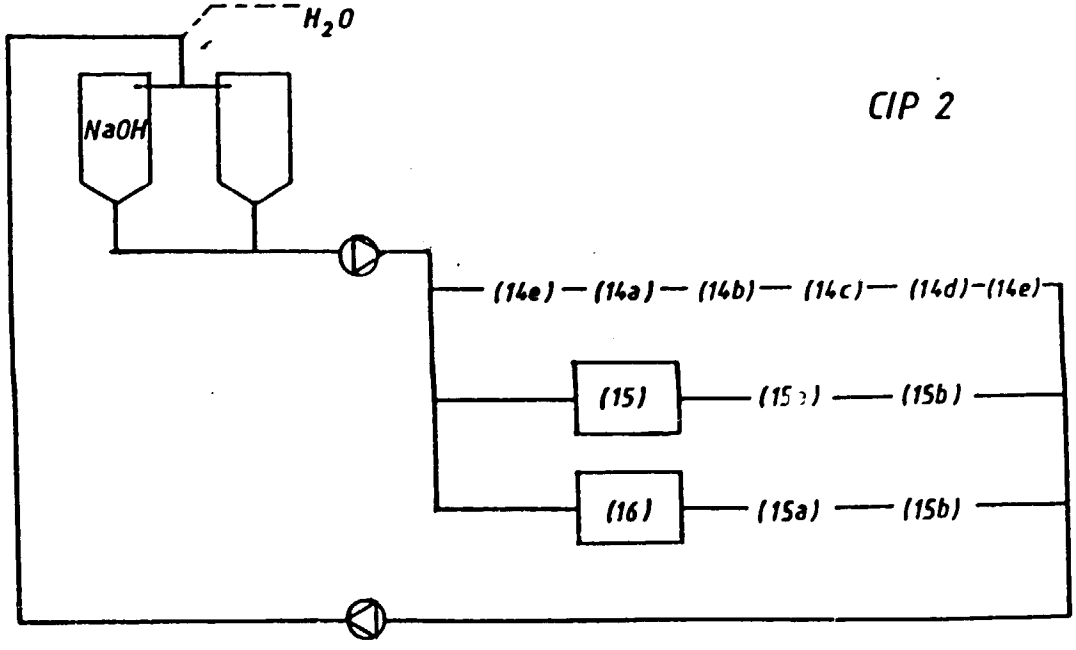


CHECK LIST BREWERY

OPERATION SCHEME

CIP 1 + 2 — 3. KOSHOS

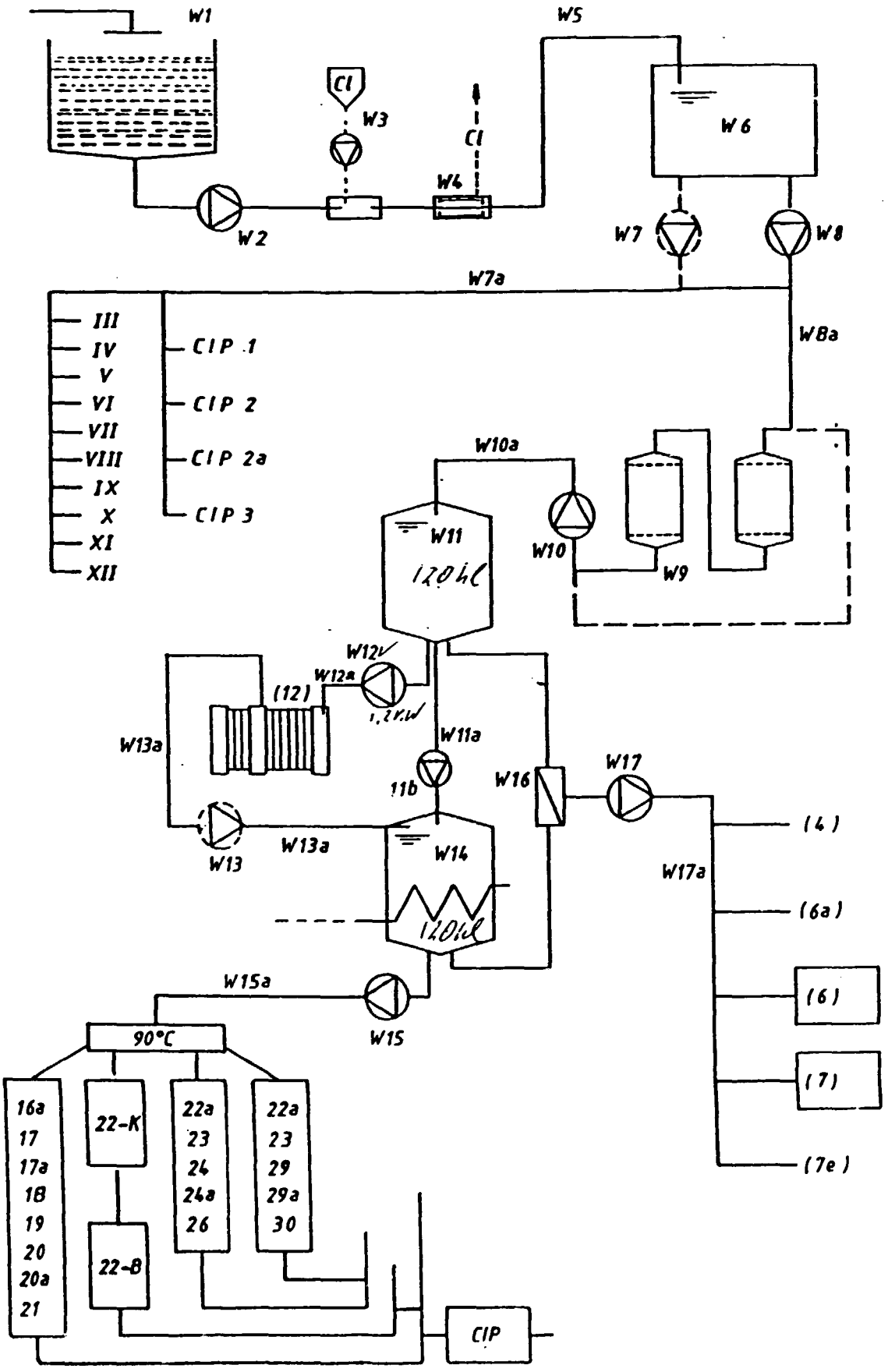




CHECK LIST BREWERY

OPERATION SCHEME

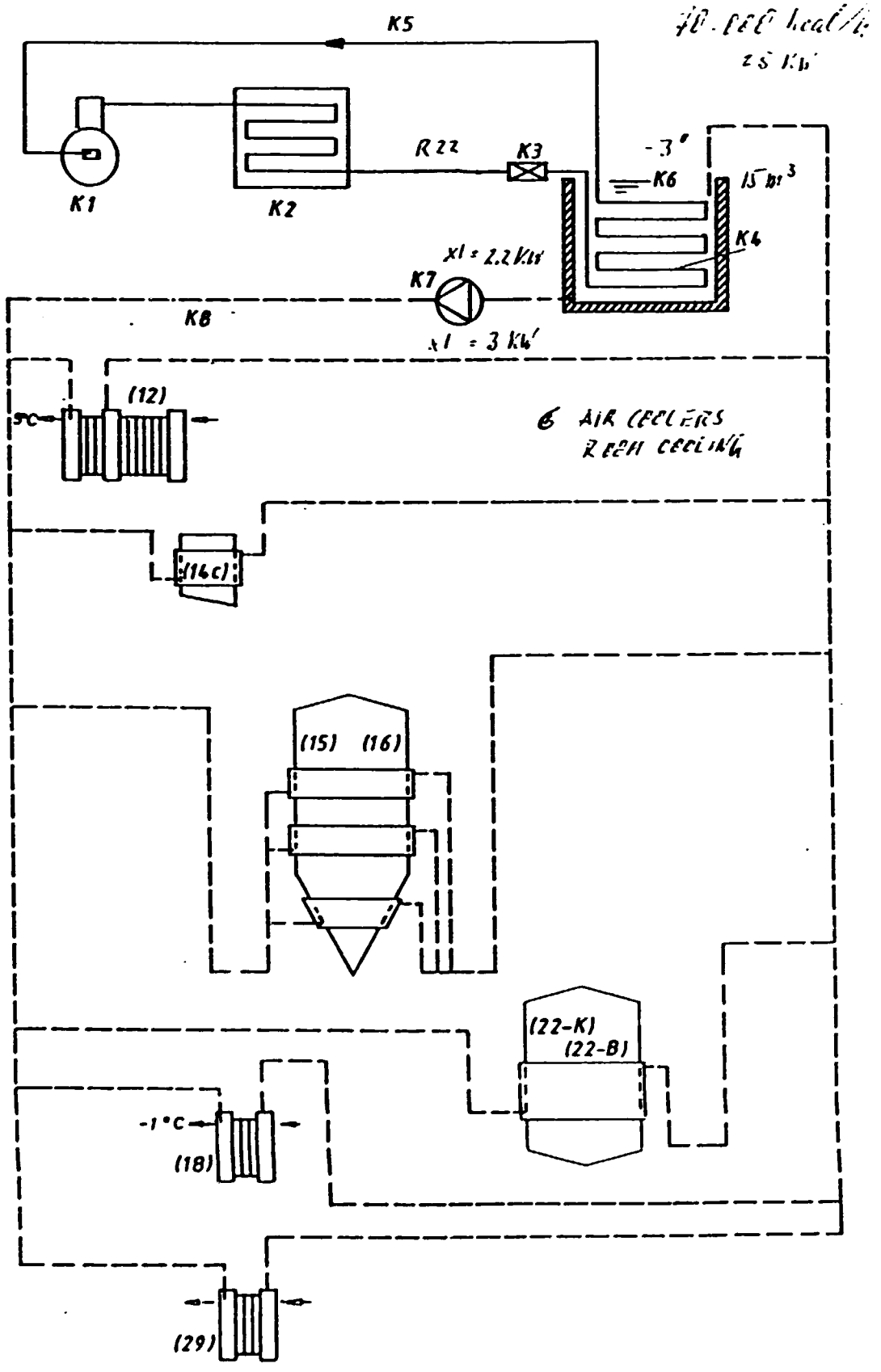
WATER 3. KOSHER



CHECK LIST BREWERY

OPERATION SCHEME

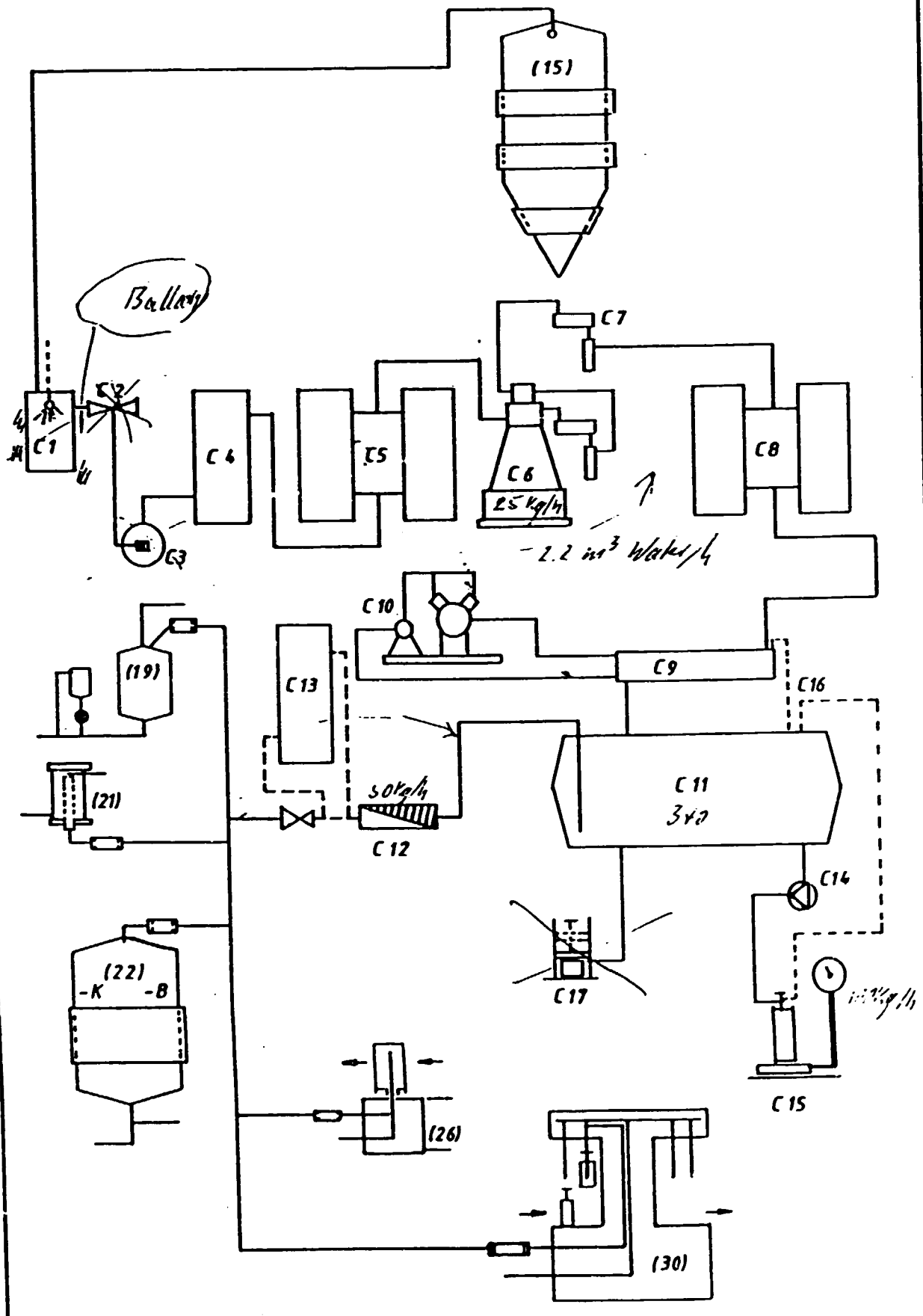
COOLING SYSTEM 3. KOSMOS



CHECK LIST BREWERY

OPERATION SCHEME

CARBONDIOXIDE CO_2 3. KOSMOS



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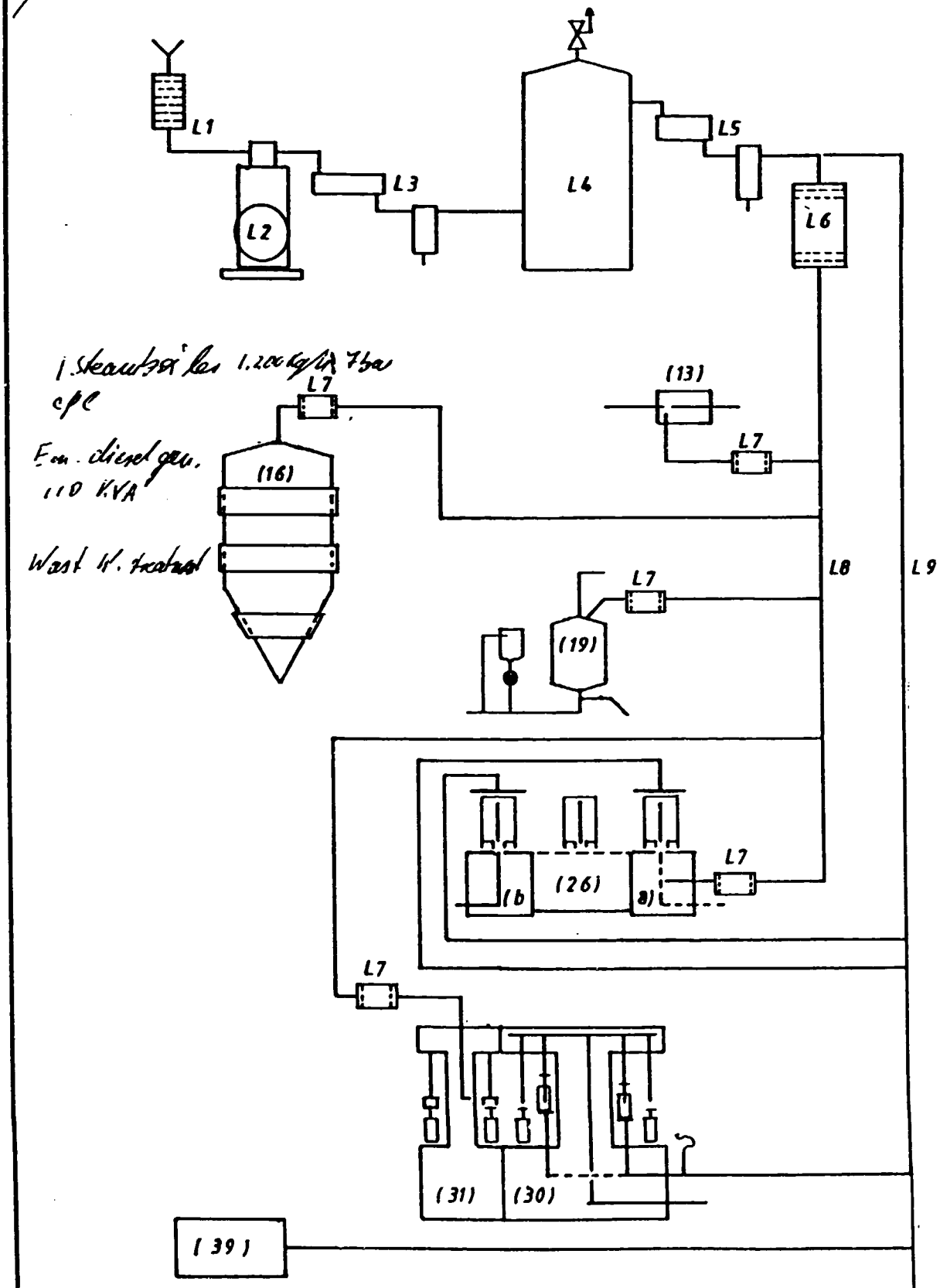
OPERATION SCHEME

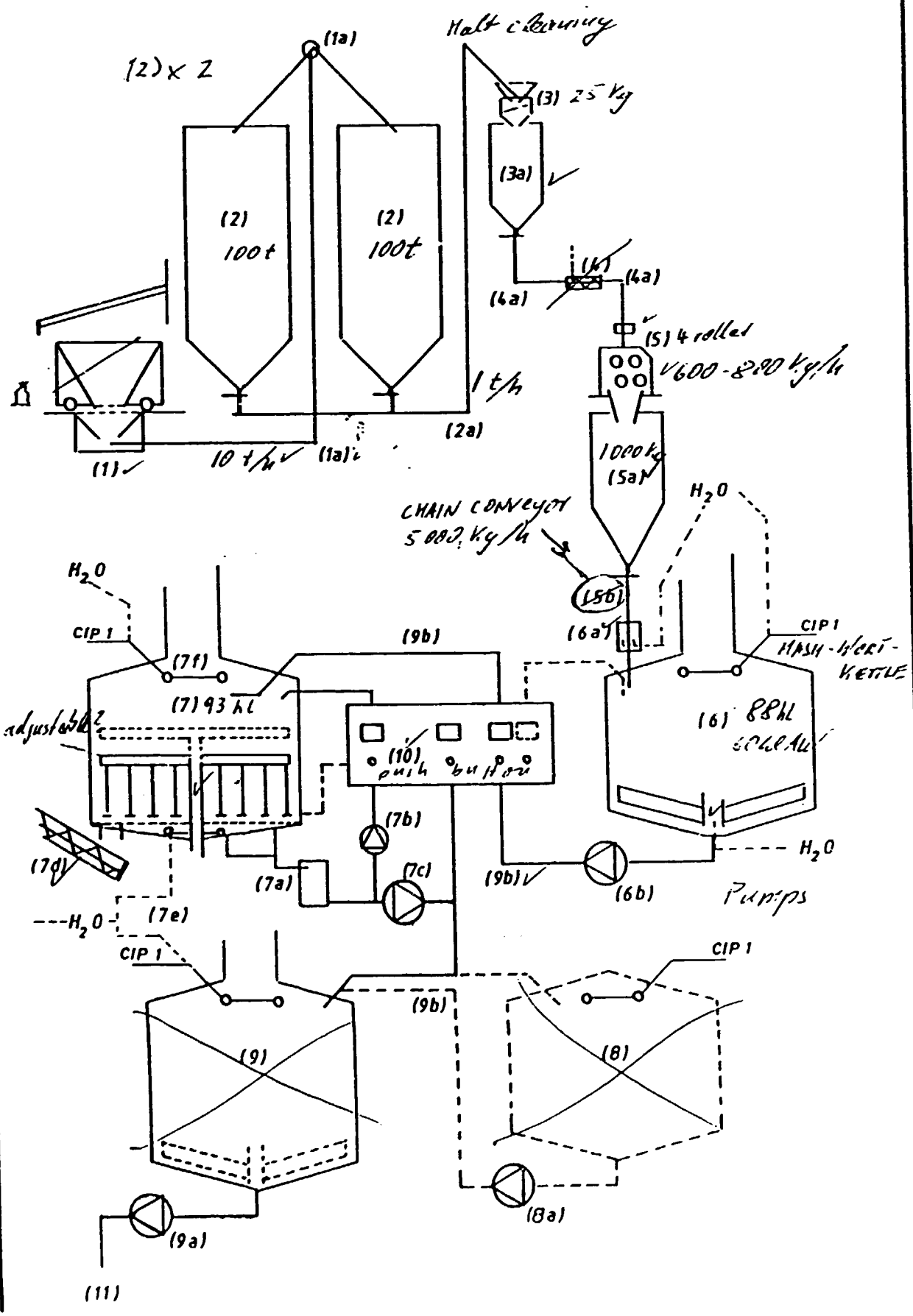
AIR 3. KOSMOS



CHECK LIST BREWERY

OPERATION SCHEME

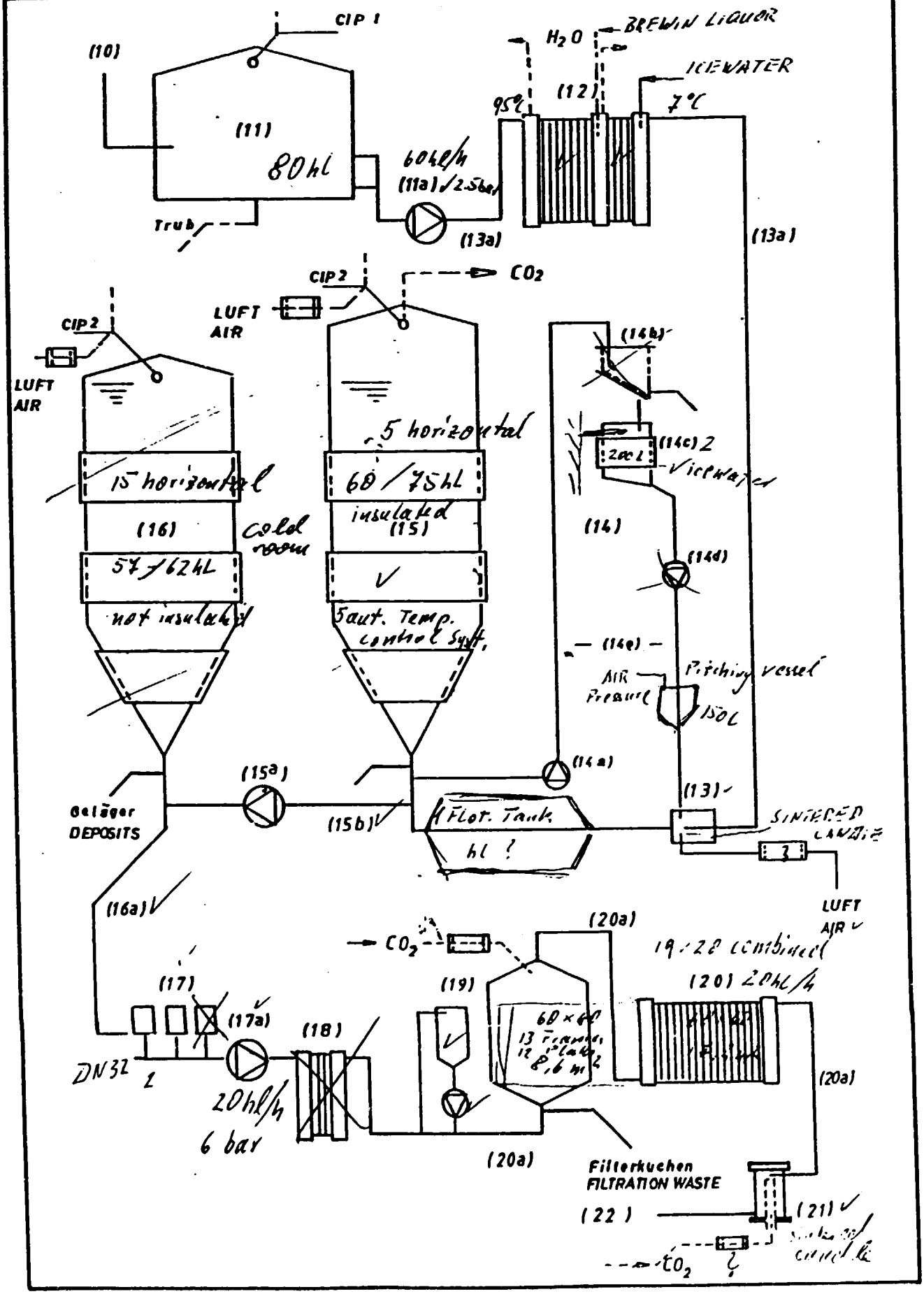
WORT PRODUCTION 4. AMS



CHECK LIST BREWERY

OPERATION SCHEME

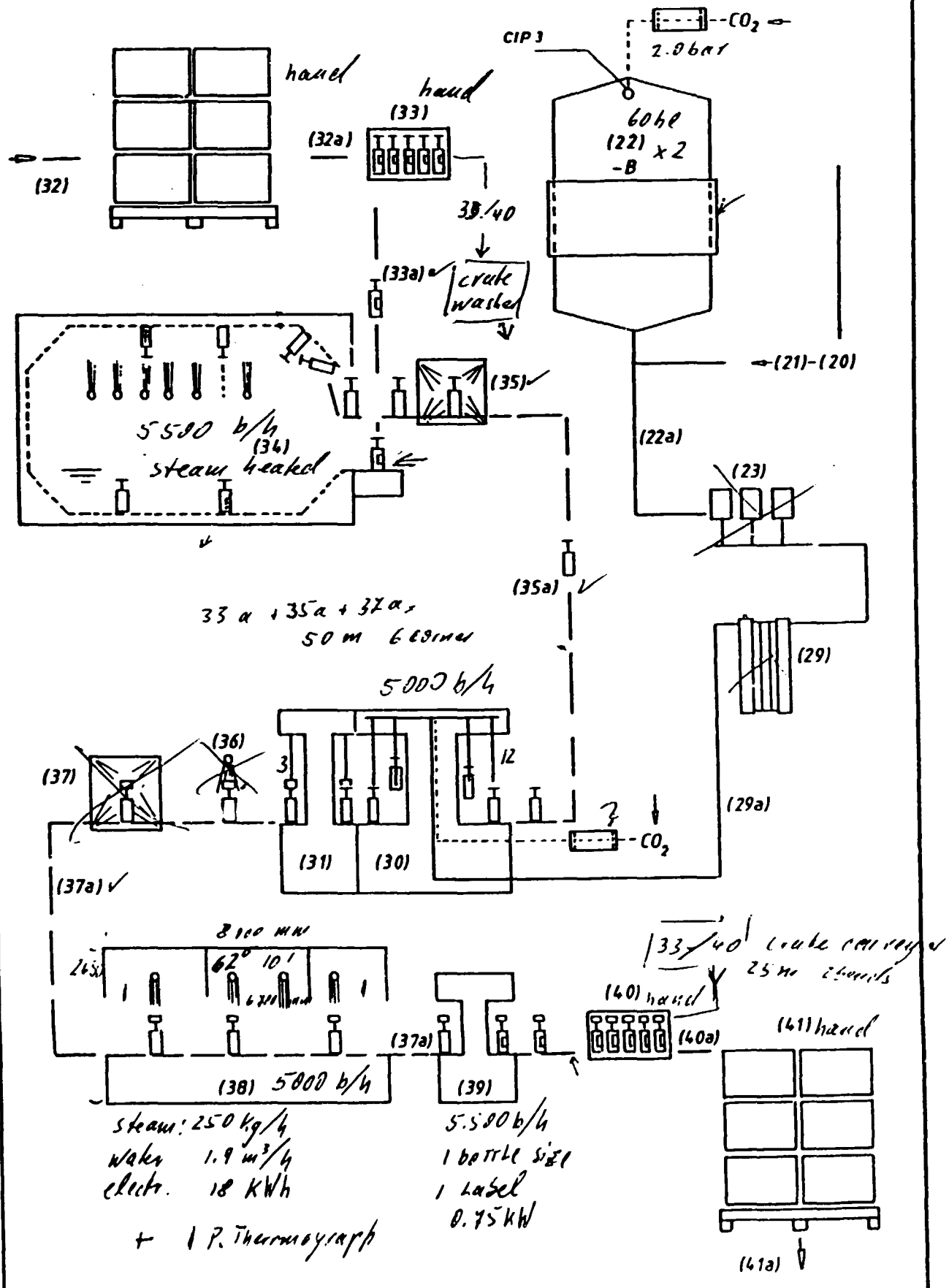
BEER PRODUCTION 4. A 11 5



CHECK LIST BREWERY

OPERATION SCHEME

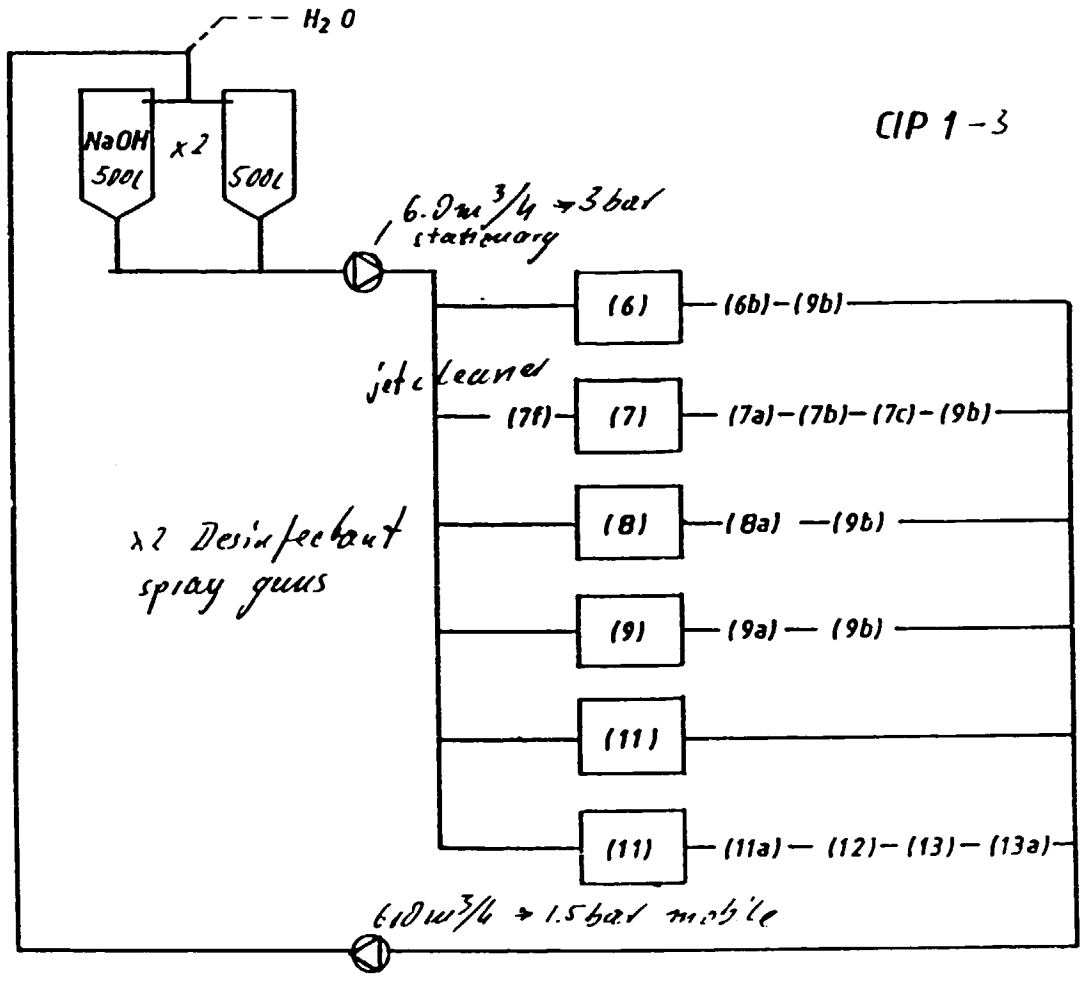
BOTTLING 4. AMS

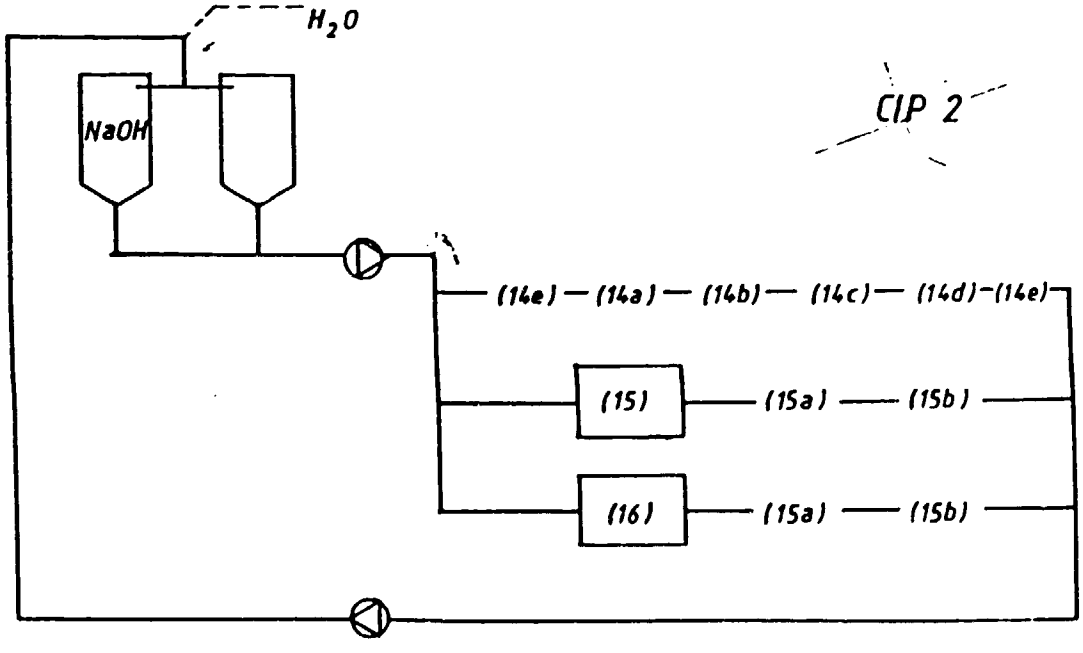


CHECK LIST BREWERY

OPERATION SCHEME

CIP ~~1+2~~ 4: AMS





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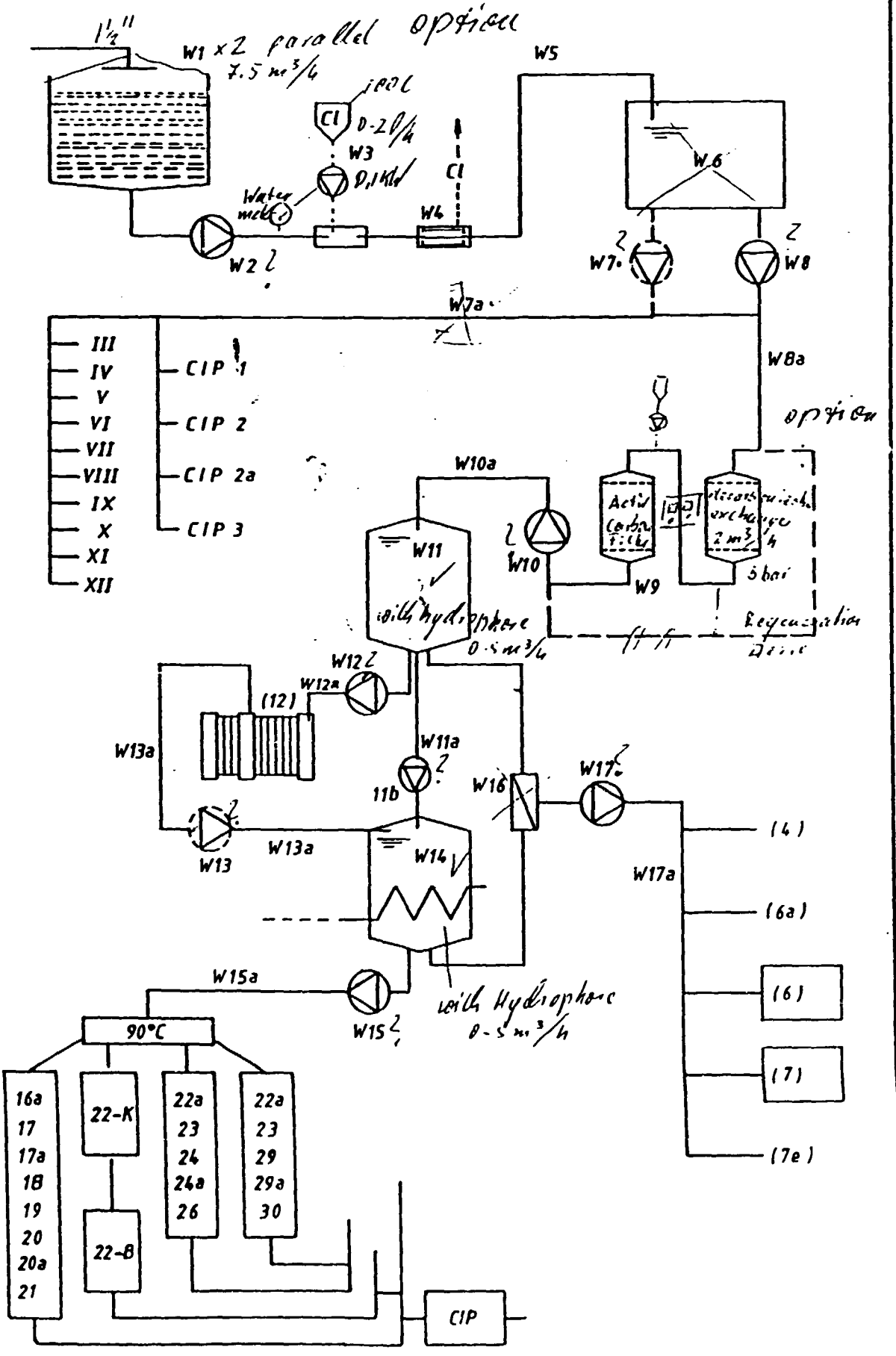
OPERATION SCHEME

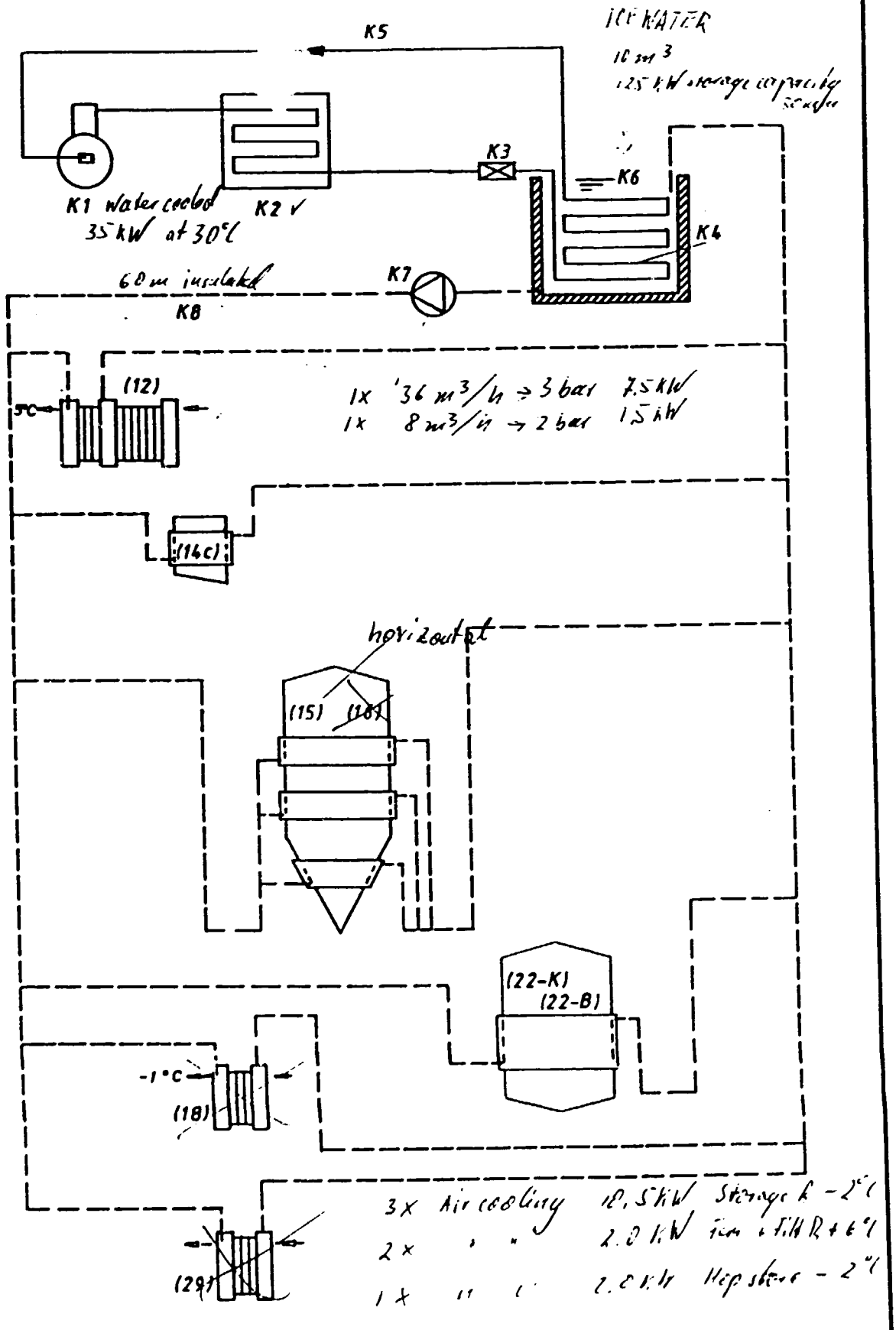
WATER 4. AMS



CHECK LIST BREWERY

OPERATION SCHEME

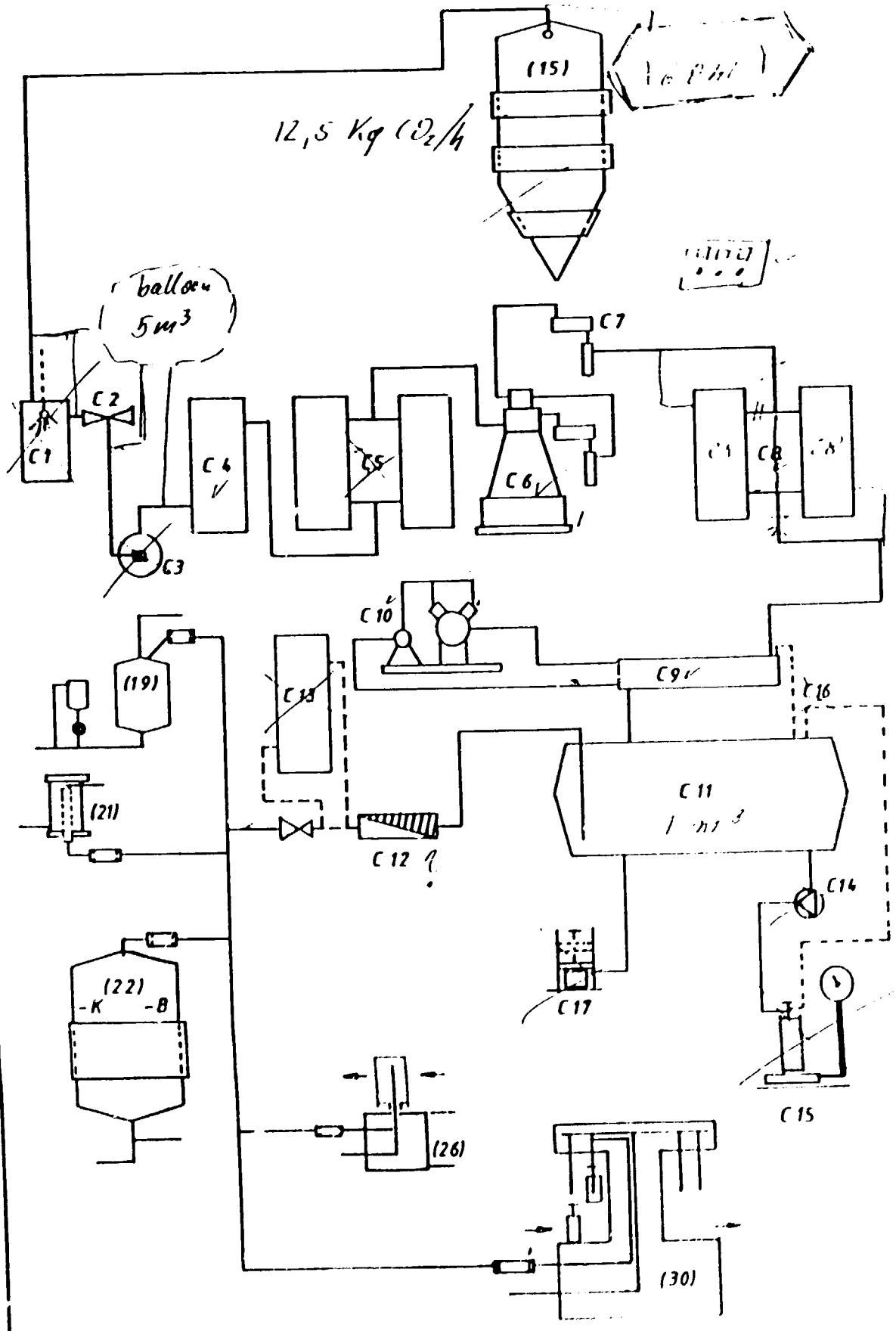
COOLING SYSTEM 4. AMS



CHECK LIST BREWERY

OPERATION SCHEME

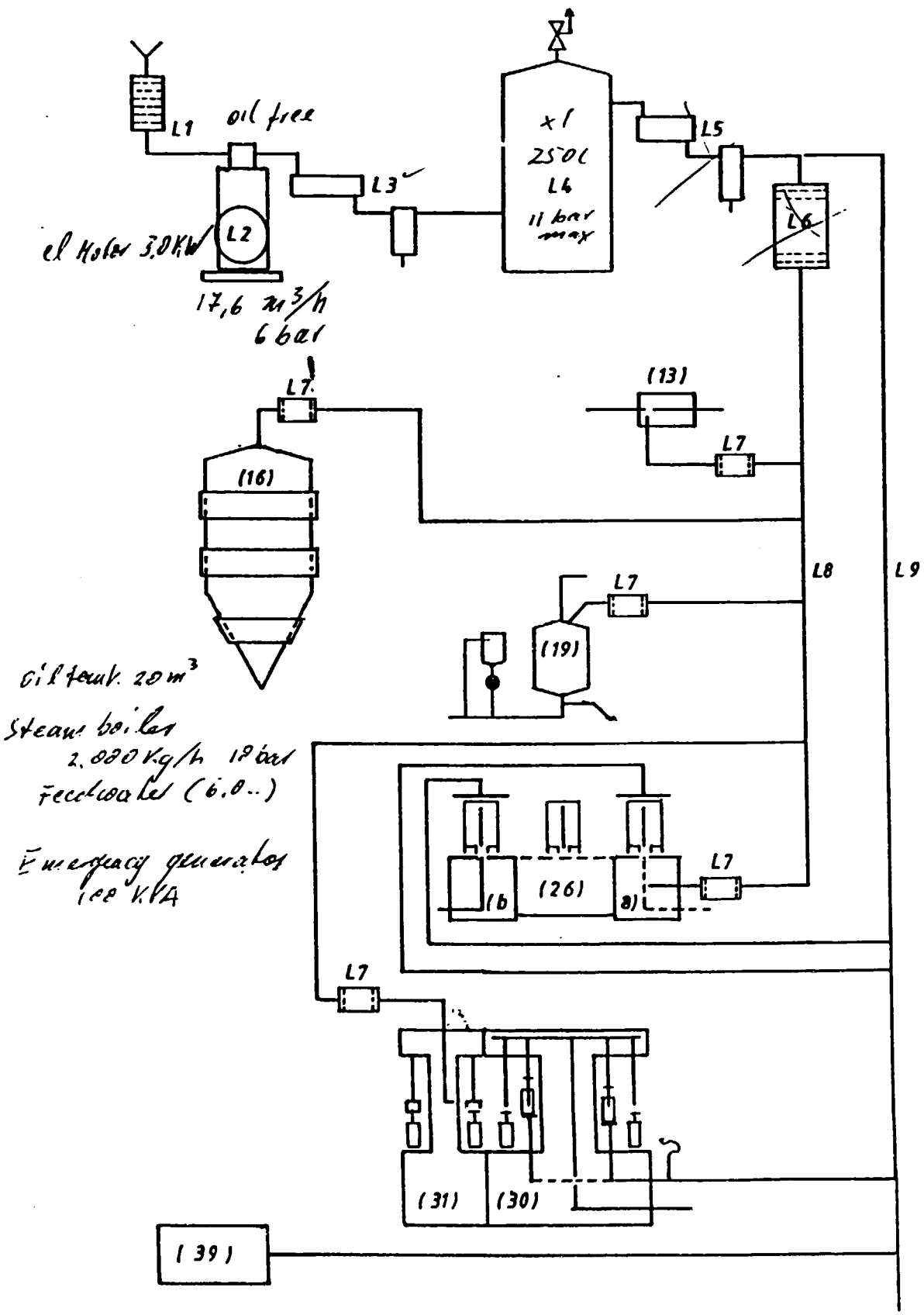
CARBONDIOXIDE CO_2 AMS



CHECK LIST BREWERY

OPERATION SCHEME

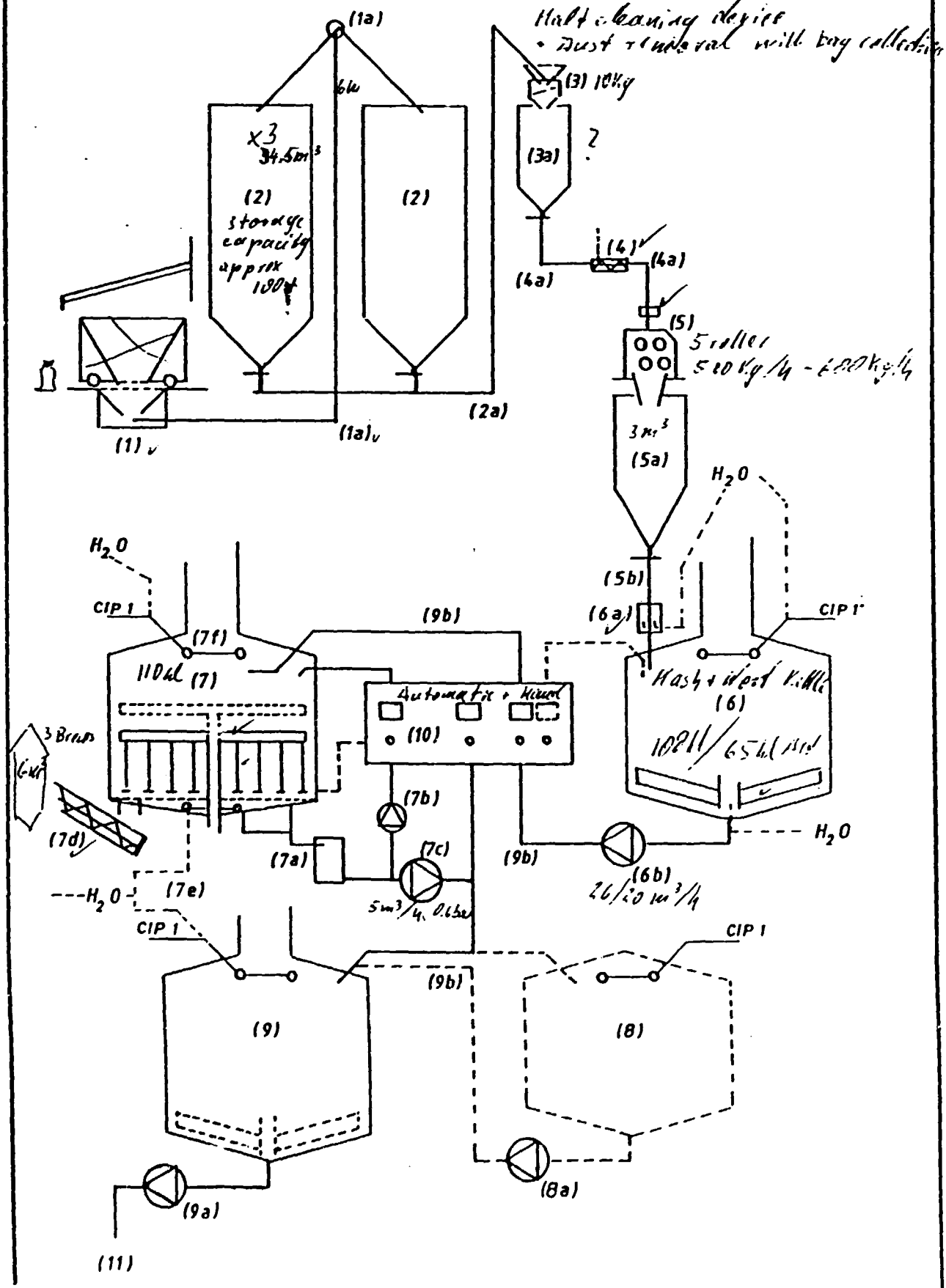
AIR 4. AHS



CHECK LIST BREWERY

OPERATION SCHEME

WORT PRODUCTION 5. h-consult



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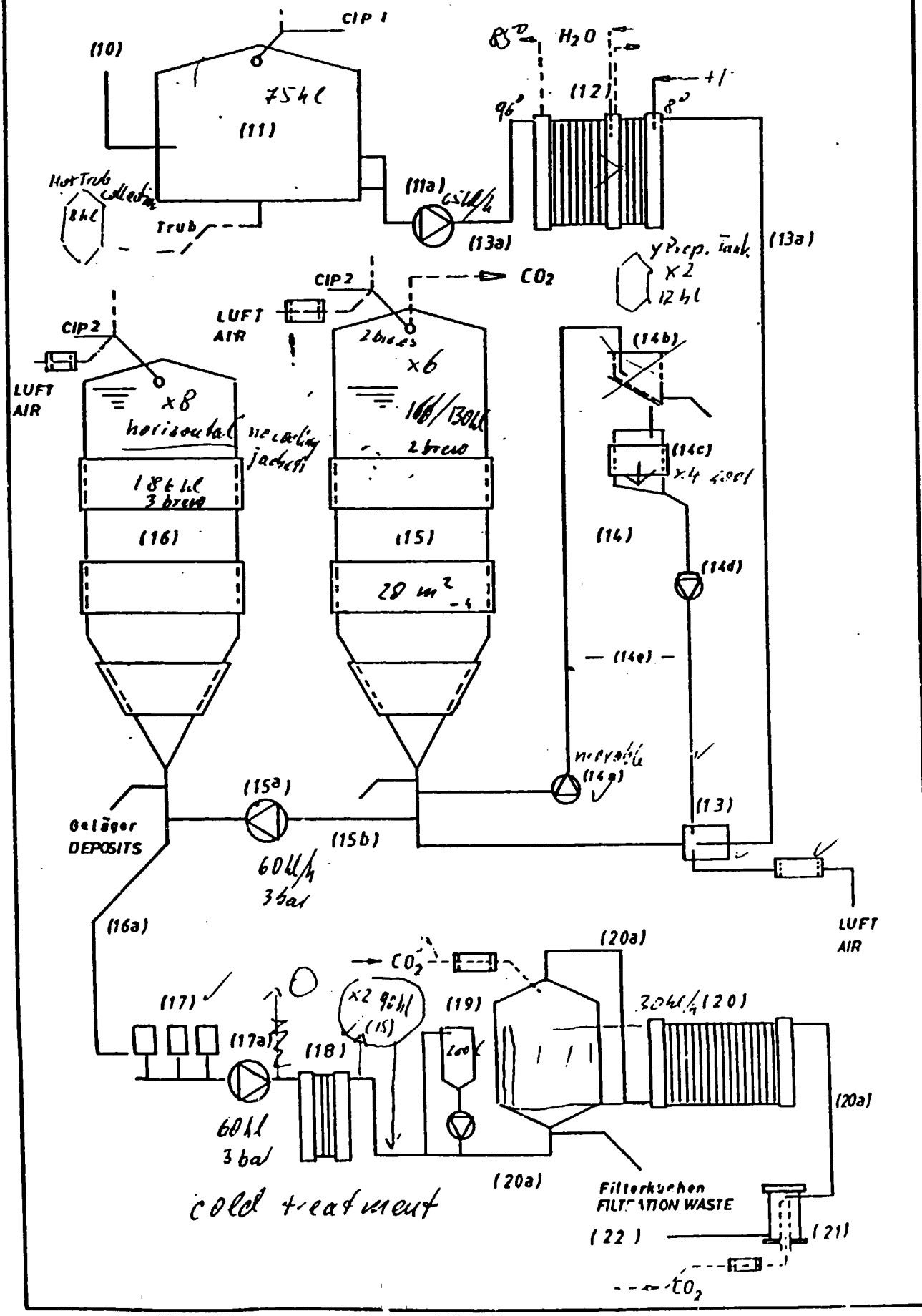
OPERATION SCHEME

BEER PRODUCTION 5. h-Consult



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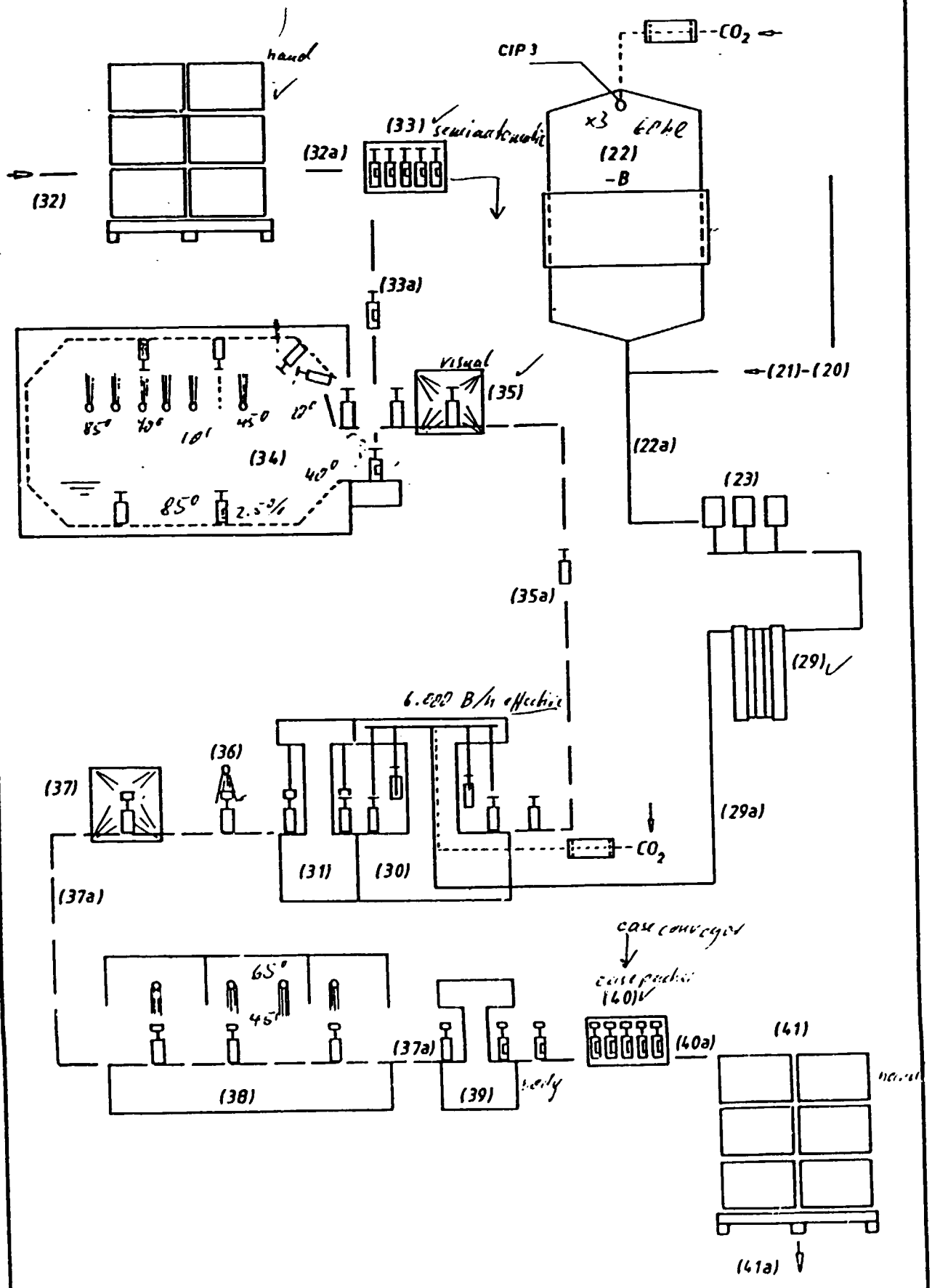
OPERATION SCHEME

BOTTLING 5. h - consult



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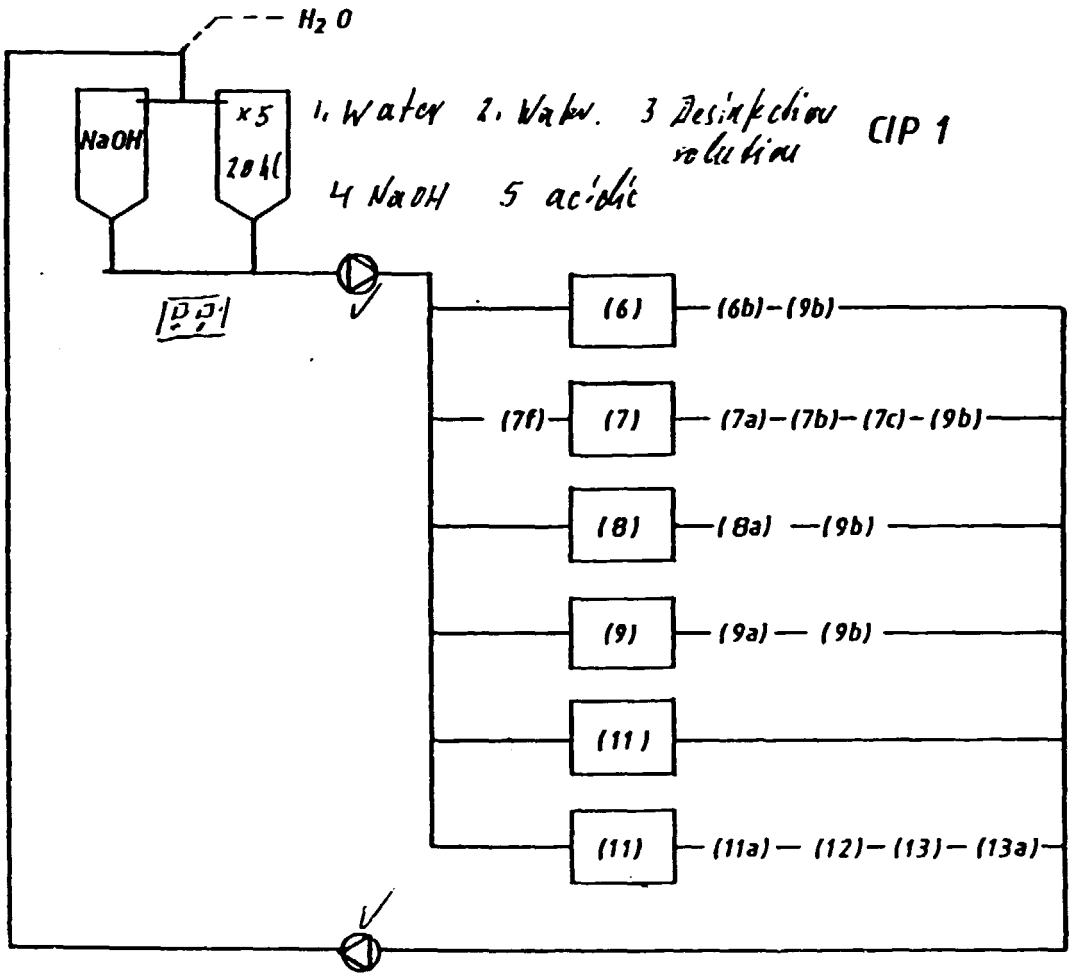
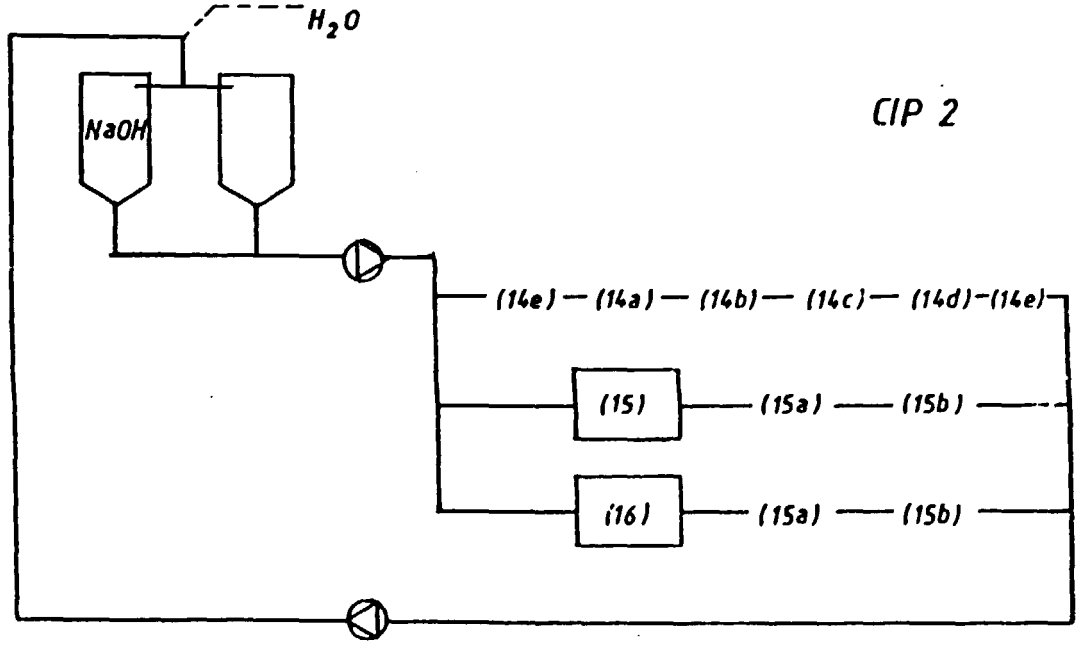
OPERATION SCHEME

CIP 1 + 2 5. h-consult





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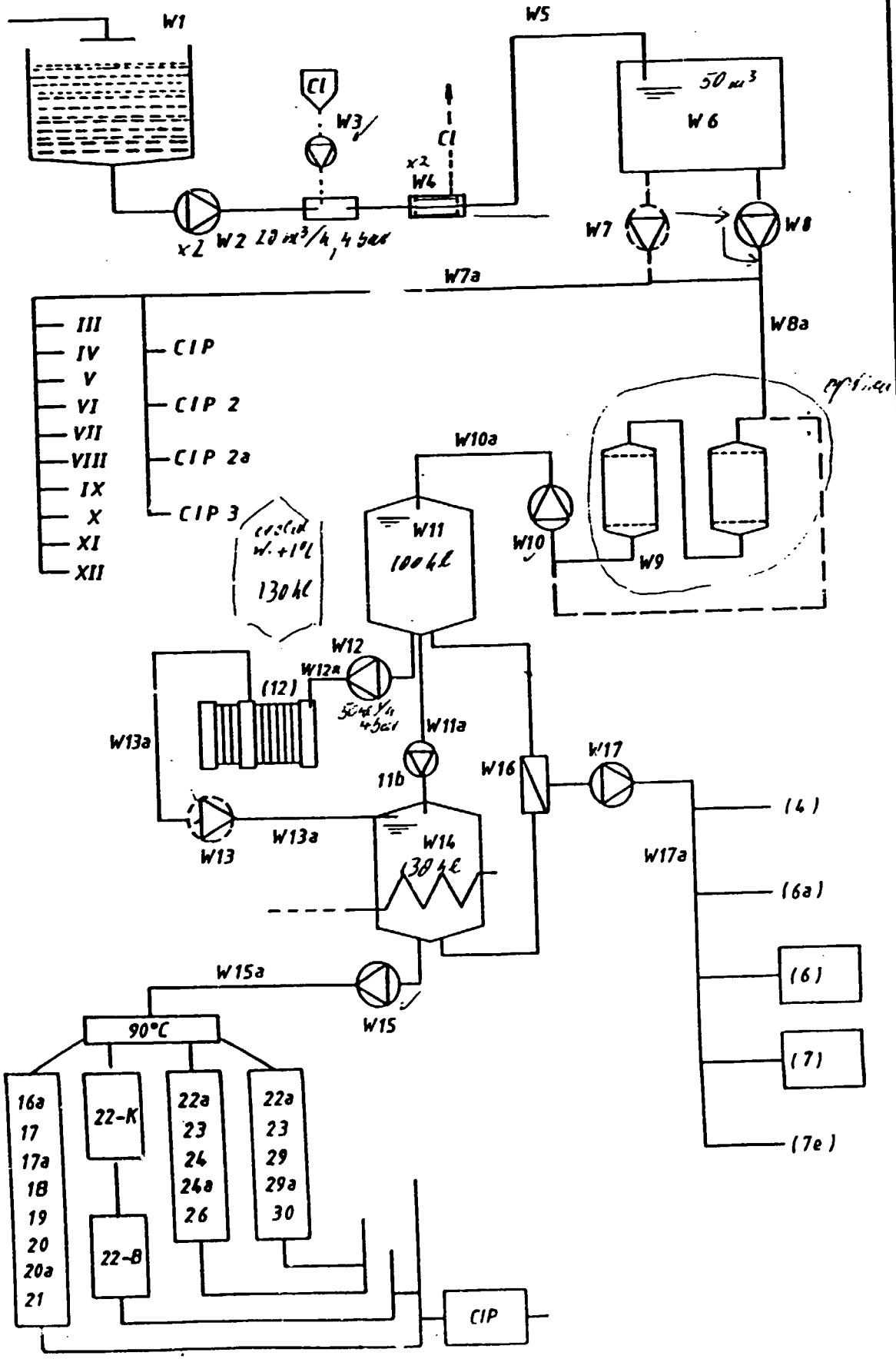
OPERATION SCHEME

WATER 5. h - consult



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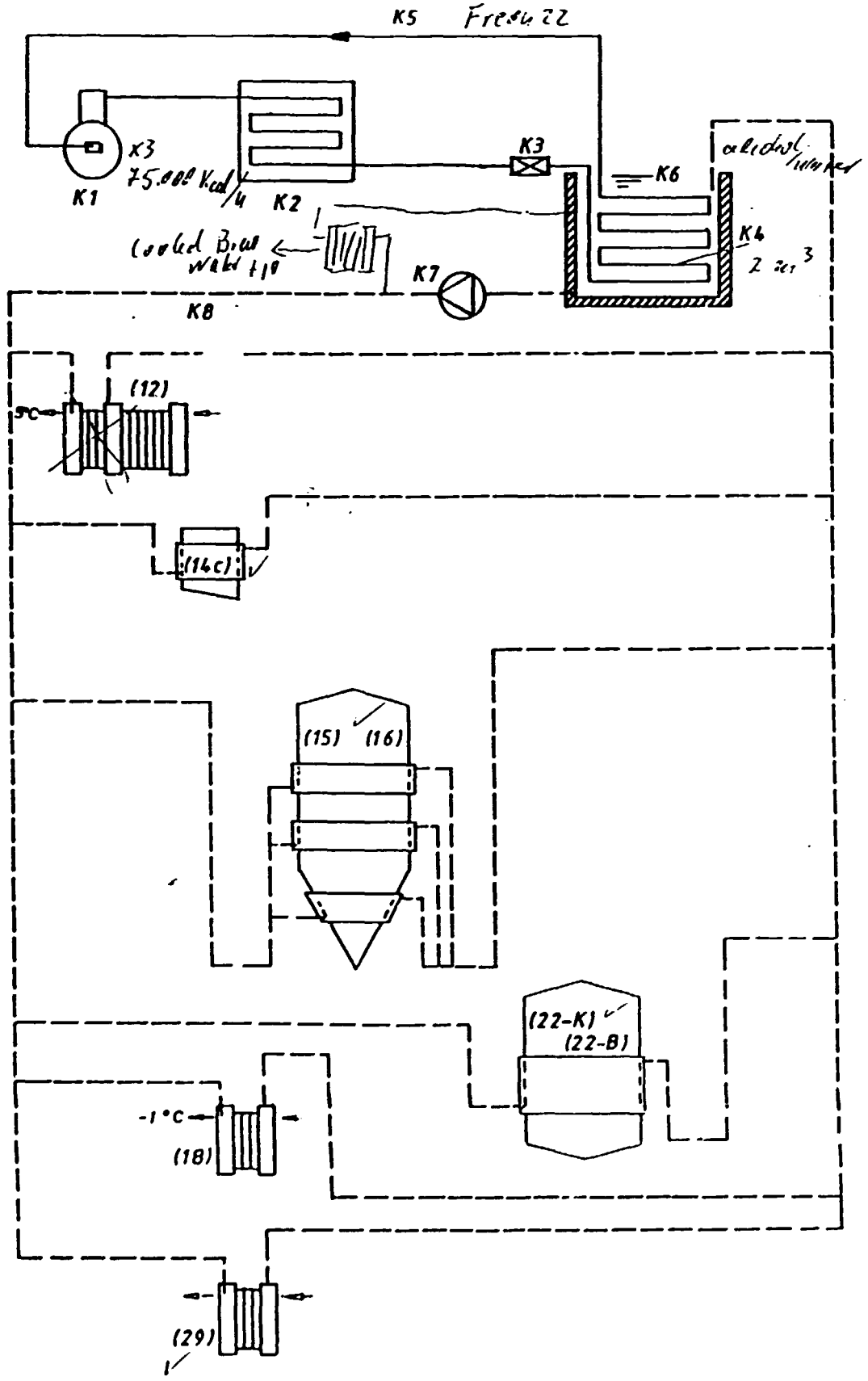
OPERATION SCHEME

COOLING SYSTEM 5. h-consult



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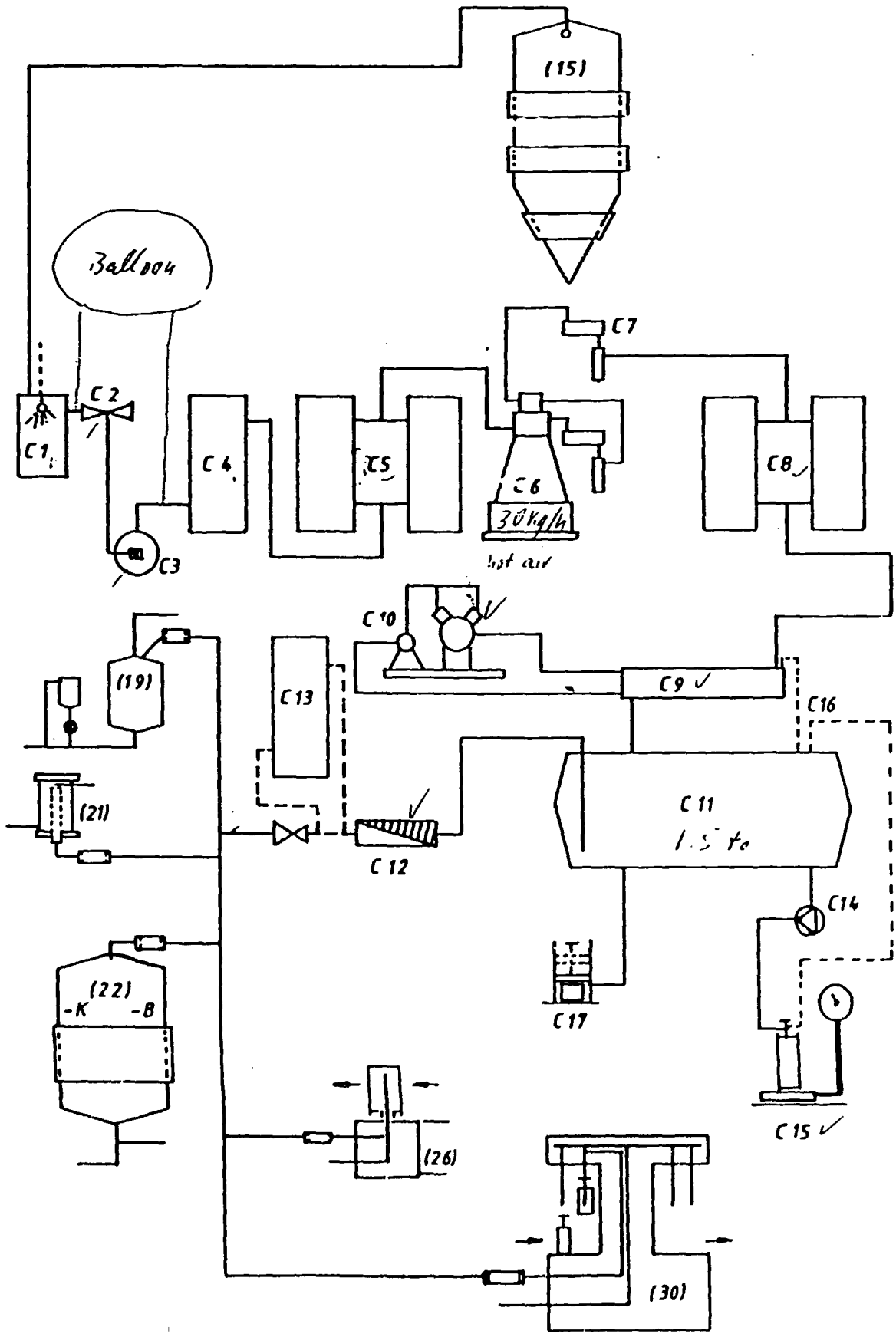
OPERATION SCHEME

CARBONDIOXIDE CO_2 5. h - consult



CHECK LIST BREWERY

OPERATION SCHEME

AIR 5. h - consult