estimating net power requirements of mixers. The data for the nomograph were obtained from their own and from those previously noted in the literature.

Two articles by Mack and Uhl (*3*, *4*) have appeared pertaining to performance of agitators. The first deals with agitator power requirements for gas-liquid contacting equipment, and the second discusses mass and heat transfer in agitator systems. Both articles are intended to show how impellers can be selected and operated for a given process application based on existing data in the literature, or from data from plant or pilot plant operation. There are a few new data in these articles, but the articles are of value primarily in calling attention to existing information already in the literature which may have been overlooked by newcomers to the field.

In the first article Mack and Uhl present again data on gas-liquid contacting by mixers and extend the data for oxygen, carbon dioxide, chlorine, and hydrogen. They also give data for the power characteristics of wire impellers. The wire impellers are simply described as having been made with piano wire, and the configuration and size are not mentioned.

An analysis of power function *vs.* Reynolds number is made along the conventional lines established by White and others, and it is emphasized that power absorbed by impellers operating in baffled tanks may be as many as five times greater than power consumption in unbaffled tanks. Several hypothetical illustrations are given to show how to scale up from pilot plant data to large size in order to illustrate the method of handling the power relations discussed in the article. These examples are exercises in the use of the dimensionless equations correlating impeller performance and are of use for this reason. Illustrative examples on gas-liquid contacting concerning the absorption of carbon dioxide in a slurry of metallic hydrozide are also given. This is an extension of previous work of the author with others. Several other hypothetical examples pertaining to gas-liquid contacting are also worked out.

The second article dealing with mass and heat transfer makes use of dimensionless correlations of Hixon and Baum and of the heat transfer data of Chilton, Drew, and Jebens. Several examples for hypothetical cases are worked out to illustrate the use of these data. A table for film coefficients of heat transfer for a large number of liquids is given. These coefficients are either those reported by Chilton, Drew, and Jebens or have been computed by the authors based on the dimensionless correlation of Chilton, Drew, and Jebens. There are no new experimental data to warrant the assumptions and conclusions referred to in the article. Several assumptions and inferences are made regarding heat transfer with relation to power input that are open to serious question, and it is not likely that the data of Chilton, Drew, and Jebens can be extended with any degree of accuracy beyond the condition specifically stated in their work. Mack and Uhl make extensions of the data to baffled conditions which were not covered by those reporting the data, and the assumption upon which the calculations are made cannot as yet be substantiated from experimental evidence.

Review. A review article covering information on mixing during the preceding year was presented by Rushton (*7*). This, together with previous reviews in Industrial and Engineering Chemistry, includes a bibliography which will bring up to date all information in the technical literature pertaining to mixing.

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SEDIMENTATION AND HYDRAULIC CLASSIFICATION

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SEDIMENTATION and hydraulic classification are very old unit operations, the theory of which is well understood. Therefore, new developments of a basic character seldom occur in the short space of time of a year or two. On the other hand, improvement in the design of mechanical equipment is a continuous process which leads steadily towards increased efficiency and a general over-all bettering of operation.

Sedimentation. The Trebler clarifier, which was mentioned in this journal's annual review of January 1946, has been rechristened the Dorr Duo-Clarifier (Figure 1), and a description of this unit in its present form may be of interest. It is basically a modification of the standard Dorr clarifier and consists of such a unit divided diametrically into two compartments by a vertical dividing wall extending from above the liquid level down to the sludge level. One compartment is used for primary settling and the other for secondary settling. The feed well and the overflow collection trough are bisected by the dividing wall with separate feed and overflow lines. Recirculation take-offs are also separated and function independently.

Figure 2 shows this unit used in connection with a Dorrco Duo-Filter for treating a biological waste at a milk plant. Flow goes first to the primary filter and then, in sequence, to the primary clarifier, secondary filter, and final clarifier. Because of lower installation costs of a Duo-Clarifier compared with two standard clarifiers of equal combined area, plus lower maintenance costs and simpler operation, the unit is proving attractive for small communities, institutions, and trade waste–treatment plants.

From two milk waste–treatment plants the following data are available. Results based on daytime composites over a 15-day period.

	Recirculation Ratio		B.O.D., P.P.M.		
Flow, Gal./Min.	Primary	Secondary	Raw	Final	% Removed
31	1.26	2.23	533	20	95.8
21	3.52	4.52	648	33	95.

	Suspended Solids, P.P.M.			Total Solids, P.P.M		
Flow Gal./Min.	Raw	Final	% Removed	Raw	Final	% Removed
31	330	31	90.3	1182	712	40.
21	363	36	90.1	1211	461	61.5

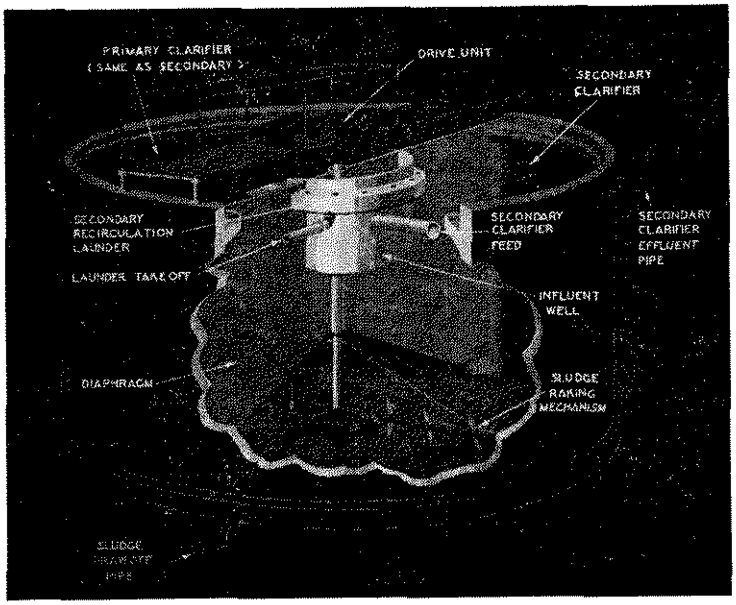


Figure 1. Primary and Secondary Sedimentation in a Single Clarifier

An improved Dorr clarifier (Figure 3), type S-7, provides additional strength and ruggedness for sizes ranging from 30 to 100 feet in diameter. A cylindrical central column of steel eliminates the conical-based concrete pier used in smaller units. Trussed-frame rake arms, providing wider support for rake blades, give greater structural rigidity and eliminate tie rods and single bracing. Longer rake blades throughout the entire length of rake arms result in fewer blades being required and lessen the chance of sludge bridging between blades. A steel cage frame, supporting the arms, simplifies erection.

The motor drive unit is stronger and simpler in construction than previous models and is provided with a double overload protection.

An improved Dorr hydroseparator (Figure 4), type H, has been developed for handling large volumes of coarse, granular solids such as phosphate rock. Units range in size from 50 to 100 feet in diameter, capable of handling 100 to 1000 tons of solids per hour. The distinctive feature is an automatic hydraulic lifting device which raises the rakes rapidly 3 feet in the event of a serious overload and then lowers them slowly into normal position when the overload has been reduced. The balanced spur gear drive is of the heavy-duty type.

An intercompartment sludge seal, designated Harms sludge seal, has been introduced for gene with Dorr tray thickeners of the washing type. seal, one for each compartment of a multitray ing thickener, permits sludge to pass readily fro compartment to the next for countercurrent wa but completely prevents the passage of solution, formerly sometimes occurred. The result is a at or close to final density, a greater displac efficiency, and a high degree of washing per u wash water.

During the last year, large center-drive dinge thickeners of the center-column type included a new automatic raising feature, as in the diagrammatic drawing of Figure 5. device is now included on thickeners manufa by this company in sizes from 100 feet in di upward. The internal main spur gear is sup on ball bearings at the periphery, and on mounted four sloping drive brackets which and drive rollers attached to the top of the *tube. During normal operation* the weight mechanism is more than sufficient to overco lifting effect of the sloping drive brackets. ever, when the torque increases to predete loading, the rollers start moving up the i bracket, raising the complete mechanism. As

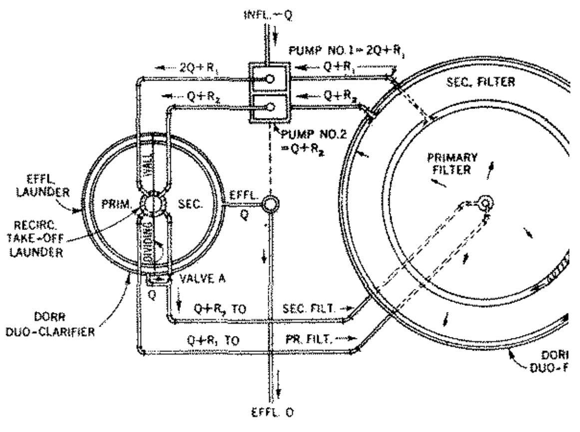
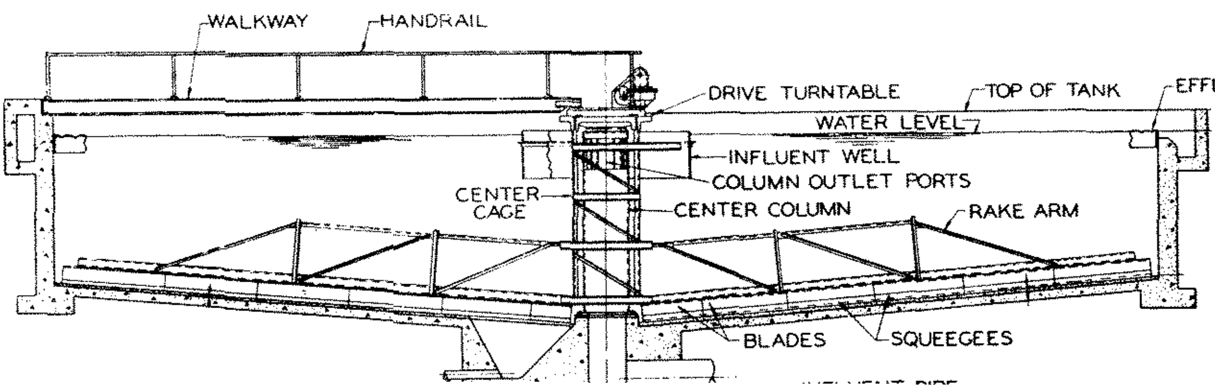


Figure 2. Clarifier-Filter Combination

Dorr Duo-Clarifier (*left*) and Donco Duo-Filter (*right*) provide a compa stage biofiltration plant for the treatment of milk and other biological



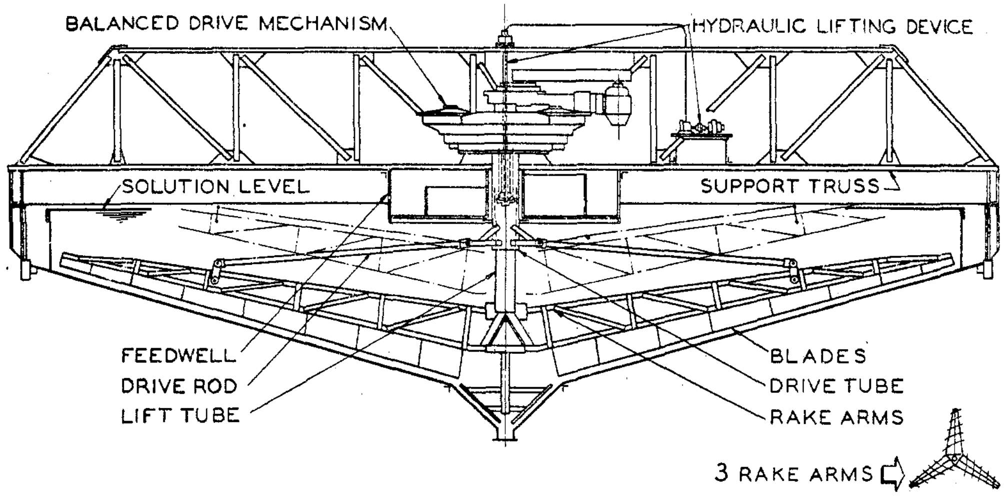


Figure 4. Dorr Type H Hydroseparator

Diameter, 50–100 feet; extra-heavy construction; equipped with an automatic, hydraulic lifting device to deal with sudden overloads.

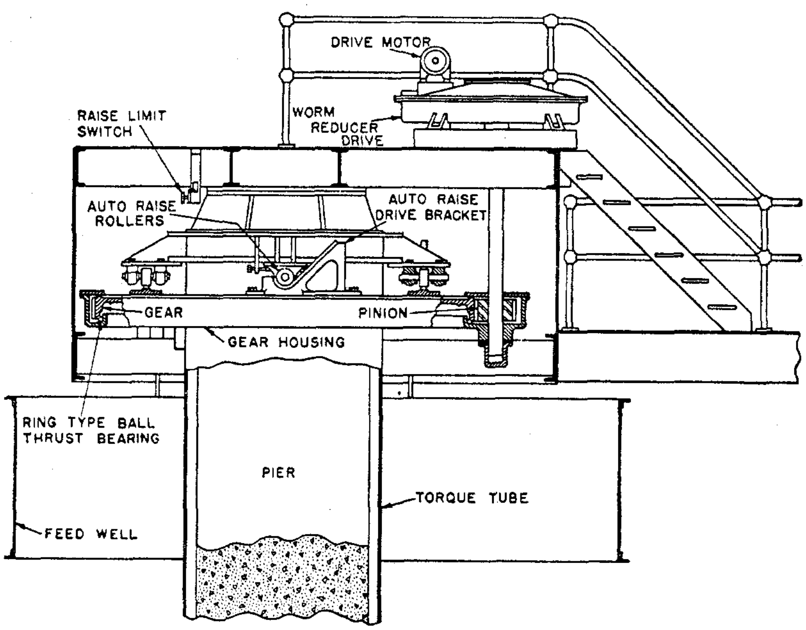


Figure 5. Hardinge Thickener of Center-Drive, Center-Column Type

Provided with new automatic raising feature, actuated by rollers on torque tube traveling on sloping drive brackets.

load is decreased, the mechanism lowers itself to its normal operating position.

The Chain Belt Company has brought out the Rex Verti-Flow clarifier. A cellular construction is secured by dividing a conventional horizontal-flow tank by a number of weirs and baffles, adjusted to regulate the flow distribution among the cells. A long weir length is provided. A clarified effluent is said to be obtained with a short detention period, primarily by reason of low vertical velocities and large weir lengths. Sludge collectors of the conventional Rex type are used to concentrate the sludge at the influent end of the tank and to maintain a fluid sludge blanket in the zone of flow immediately below the baffles. Operation of this unit as a thickener is reported to be limited to applications where a sludge blanket can be maintained without fear of septicity.

Classification. No distinctly new and novel classifiers have been introduced for several years. Existing designs have been modified and improved in minor respects, but these are not regarded as being of sufficient importance to warrant discussion of this article. It may, however, be said that The Dorr Company is in the final stages of developing a new classifier model that will probably be announced publicly a year or so hence. This development, based on the utilization of new and novel mechanical principles for achieving the desired rake motion, aims at a general over-all betterment in classification practice.

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