

Development of Threshing Machine in Japan

By FUKUJI MIYAZAWA

Chief, 1st Laboratory of Farm Operation, Farm Operation Division,
Central Agricultural Experiment Station

Methods of threshing in the oldest threshing devices consisted of the flail, beating table and threshing sticks. In 1600 the *Senba* thresher was invented and it was used for 300 years up to the Taisho era when the pedal thresher was introduced. (Fig. 1).

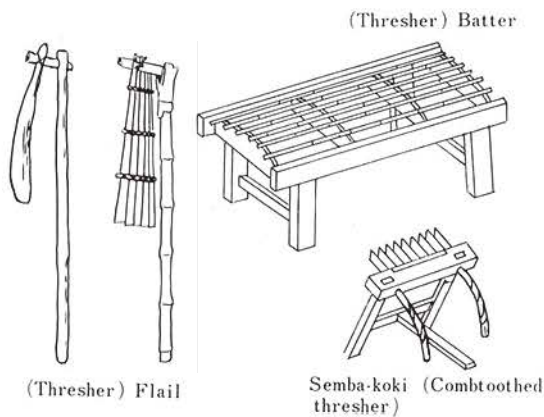


Fig. 1. Oldest threshing device in Japan

This thresher was invented in Japan in 1911 independently from the Western style pedal thresher or treading thresher and was widely used in all countries of the world.

The pedal type machine was improved in the later Taisho period to the power driven type and to the self-feeding thresher or unique Japanese type thresher to which rice crop stalks are fed by themselves (Fig. 2).

The Western style throw-in type thresher was studied in Japan after the war but it was not developed. The study on combines was launched and Western style combines were

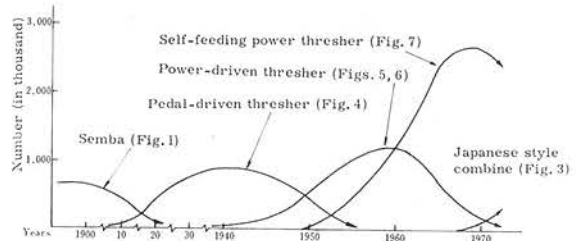


Fig. 2. Distribution of threshing machine in Japan.

produced. At the same time (1963), small size combines were developed as they were suitable for the small farm lands in Japan.

The Japanese style combine is a machine which combines the self-feeding thresher with the reaping device (Fig. 3).



Fig. 3. Japanese style combine

Pedal-driven thresher

Crank (A) is connected to the big gear (B) which, in turn, drives the little gear (C) fixed on the cylinder. Thus, your foot revolves the

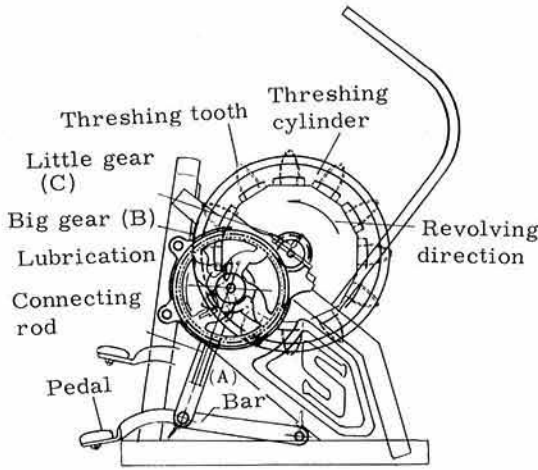
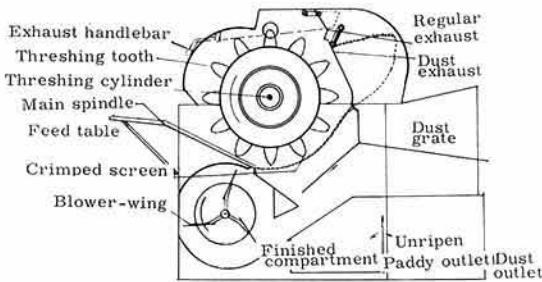


Fig. 4. Pedal-driven thresher in Japan

cylinder. The cylinder has a number of bars on which many threshing teeth are set in. As the cylinder revolves, the steel teeth beat off the paddy out of the heads fed on it. The shield beneath and the hood above the cylinder prevent the scattering of the paddy and dust.

Power-driven thresher

In this machine, both the threshing cylinder



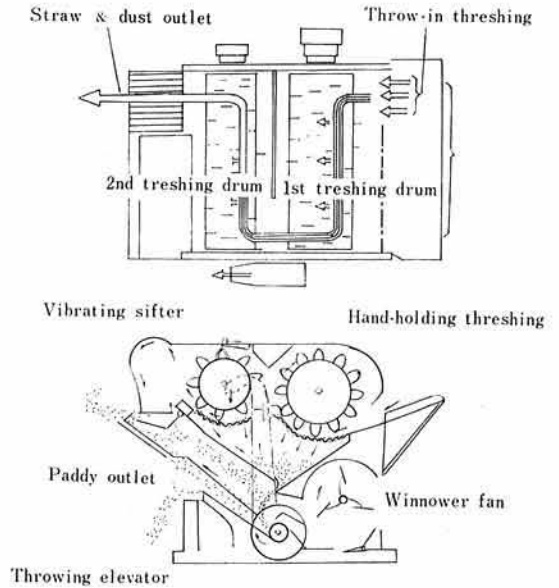
Capacity (Paddy) 200~400 kg/hour
(10~20 bushels/hour)
Power required 3~4 HP Engine

Fig. 5. Power-driven thresher

and the cleaning fan can operate at the same time.

Consequently, not only threshing but also cleaning can be done effectively and efficiently. During operation, neither paddy nor dust is scattered by the machine which can separate ripen and unripen paddy from dust. In addition, the machine pours paddy into bags or other containers.

Model shown in Fig. 6 comprises two similar



(for cleaned paddy)

Capacity (paddy) 300~500 kg/hour
(15~25 Bushels/hour)
Power required 4~5 HP Engine

Fig. 6. Double-drum power thresher

threshing drums arranged front and rear in parallel running at the same circumferential speed. The materials put into the first threshing chamber are mostly threshed there and the stalks remaining inside are automatically conveyed into the second threshing chamber after they are chopped into small pieces by the first cutting blade.

Unthreshed paddy still remaining on the ears are completely removed in the second threshing chamber and the straws after being cut further are automatically exhausted out of the straw and dust outlet. The grains that

have dropped through the separating screens are then separated by the winnower fan and divided into the whole paddy and the unripen paddy. The unripen paddy will be blown out from the unripen paddy outlet and the whole paddy is taken out by means of the throwing elevator. A small amount of unripen paddy which might be blown out and be mixed among straw pieces and dust will be also recovered in the unripen paddy outlet by the vibrating sifter and the ripen paddy reversing system.

"Throw-in" threshing: When the paddy is picked by the ear or reaped by short stalk to the length preferably less than one foot, you can just throw these paddy ears with or without the stalk into the threshing chamber through the front right-side feed opening, and the thresher automatically threshes, separates and cleans the paddy, exhausts straw chips and dust and turns out the finished cleaned paddy.

Self-feeding power thresher

This machine is used when rice is reaped about 2 ft. long. It is an epoch-making feat in view of the fact that while threshing, rice stalks are sent automatically from left to right by means of a chain instead of being held by hands.

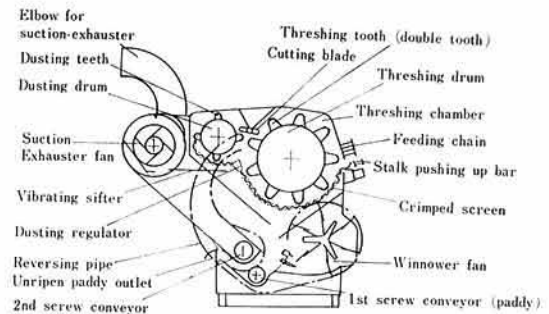
1) Rice stalks to be threshed are placed on the feeding table attached to the left end of the machine, and must be fed continuously in small quantities by hands into the feed-in opening of the feeding chain. As for the method of feeding, rice-ears must be first taken into the threshing chamber and then make the feed chain grip the opposite part of the stalks. Inserted stalks are sent left to right tightly gripped between the feeding chain and the stalk pushing up bar and are guided out by the straw guide out pipe.

2) Inserted rice stalks are threshed while

being shifted by the feeding chain under the rotating threshing drum. When threshed paddy goes past the crimped screen, dust and other foreign mixtures are separated by fanning, and only the whole mature paddy is carried by the first screw conveyor over to the throwing elevator and discharged outward at the cleaned paddy outlet.

3) Rice stalks chopped short and still unable to pass through the screen are to be sent to the auxiliary threshing drum, where stalks with paddy are given the second threshing and then another screening by the auxiliary screen and the vibrating sifter. Only dust and straw are to be discharged outside the machine through the suction exhauster fan.

4) Dust and paddy having passed through the screen undergo separation by fanning inside the winnower, in which case the dusting regulator must be operated carefully so as not to blow the paddy out of the dust discharge outlet.



Capacity (paddy)	400~600 kg/hour (20~30 Bushels/hour)
Power required	4~5 HP Engine

Fig. 7. Self-feeding power thresher

Reference

- 1) Nihei, T.: Development of farm machinery for Japanese paddy rice field. *Farming Japan*, V, (1967).