

with cast teeth, and the rack had a double section having the teeth staggered to give a smooth and uniform motion to the table.

Fig. No. 26 illustrates one of the first machines built in the Bertram Works in 1867. The power is delivered to the table by a single 3" belt running at a velocity of 512' per minute, with a gear ratio of 6.25, giving an effective pull on the table of 3750 lbs., and a cutting speed of table 20' per minute.

Fig. No. 27 represents a 36" planer, driven by two 3" belts, one of them being used as a forward or cutting belt, and the other for the reverse motion. A belt velocity of 1,000' per minute and a gear ratio of 13.4 to 1 delivers an effective pull on the table of 8180 lbs., at a cutting speed of 20' per minute.

From the above some idea is given of the gradual development of iron planers. In recent years modern shop construction demanded economy in space and a more convenient shop layout. This led to the adoption of an individual drive made possible by the improvements in electrical machinery, and for the past eight or ten years the usual plan of mounting the motor on top of the planer housing has been followed. This plan is more or less faulty, due to a liability of the machine producing defective work by reason of the natural vibration caused by the motor being placed in that position. To obviate this danger the use of pneumatic clutches was introduced, and a motor drive placed at the base of the housings.

Fig. No. 28 represents a motor drive mounted upon the housings of the machine, power being transmitted by four belts, two for cutting and two for reverse. This drive was developed to give increased belt pull without excessive belt shifting velocity. The increased pull wide single belt for both forward and reverse motions would demand double the shifting speed to obtain as prompt and uniform a return of table as the original narrow belt required. This increase of shifting speed was practically impossible, hence the introduction of the four-belt drive. With two narrow belts for each motion the required increased pull is obtained, and the same facility of shifting remains as in the old two-belt drive without any increase in shifting velocity. In this construction by a gear ratio of 8.8 to 1, a belt velocity of 1,330' per minute, an effective pull on the table of 10,000 lbs. is obtained at a cutting speed of 36' per minute, at the same time maintaining a comparatively low belt speed and the use of a 5" belt for the cut and return.

We now reach the most modern drive applied to iron planers, and the following is quoted from a circular issued by the Pond Tool Works of the Niles-Bement-Pond Company at Plainfield, where the improvements were designed and carried out. Fig. No. 29 represents the machine in question.