and a large amount of power hitherto lost is now turned to useful effect. For lubricating purposes ring bearings are a considerable improvement over the ordinary form. In these bearings a broad ring is fitted loosely to the shaft, revolves with it, and dips into an oil reservoir at the bottom of the bearing, and brings a certain amount of oil up to the top of the shaft, which flows over the bearing through oil ways and back into the collecting reservoir. It can be filtered and used over and over again, thus effecting considerable economy, and at the same time keeping the bearing thoroughly lubricated for a considerable time with little or no attention. The loose ring should be broad, and be made flat on the inside and rounded on its rim. Care must be taken that the oil is not allowed to get worn out or thick, or the ring may cease to revolve. For high speeds the rings should be smooth and without projections, which carry the air round and form air bubbles in the oil, which also oxidises quicker, but owing to the speed and consequent centrifugal force scrapers must be fitted in the bearing to deflect the oil into the oil ways; these must not, however, touch the ring or they will stop it revolving.

## SAWMILL ENGINES.

## By H. E. Welch.

To one who has watched the development of the sawmill industry during the past quarter of a century, there has been no part of the improvement in the appliances for the manufacture of lumber that has been of greater interest than the gradual introduction of the better types of engines and boilers into the power plants of the larger mills. Until within the past few years, there was no part of the sawmill equipment on which so little care and attention was bestowed as on the power end of the enterprise; this too in spite of the fact that its success from a mechanical-and often from a financial-point of view, was primarily dependent on the power being adequate to the proper driving of the mill machinery. It is probable that in no other line of manufacture, is the service exacted from the engine so severe as in the sawmill, the rolling mill being the only exception; these, however, are usually equipped with engines specially designed for heavy duty. While there was-and for that matter still is-a class of engines alleged to be " sawmill engines " yet this simply meant that they were so designed and built, that the price at which they could be profitably sold rendered them attractive to the purchaser. These engines were practically all of the slide-valve pattern, with throttling governors, requiring an enormous amount of steam per horse-power; so long as they performed the task of keeping the line shaft revolving with reasonable regularity they were entirely satisfactory to their owners. The boilers too, were as a rule, of a kind the chief merit of which was their ease of installation and small cost of maintenance, and the two flue boiler was for many years a favorite; that they required an immense amount of fuel as compared to the steam produced, was rather a point in their favor.

The reason for this condition of things was doubtless the fact that fuel was plentiful, and cost nothing; all improvement in the designing and construction of engines and boilers has been occasioned by the necessity for economy in fuel, and every new design that promised a saving in this item, at once received the earnest attention of power users, the result being that in most lines of manufacture requiring considerable quantities of power, both boilers and engines were of the latest and most economical type. Where the cost of the fuel consumed in a single year's operation was often greater than the cost of the boilers under which it was burned, and the engine driven by the steam it produced, the importance of the highest attainable duty per pound of coal is readily seen, and the Corliss or some form of automatic engine, together with high pressure boilers are now to be found in most of the manufacturing plants of to-day.

With the sawmill man, however, there was always a large surplus of refuse to be disposed of, and the more that was burned under the boilers, the less there was to be got rid of in some other, and usually more expensive manner, and the saving of something that was worse than useless to him, did not appeal to the mill owner. With the invention of the band mill, which so soon as it proved itself a success rapidly displaced the circular, a new condition confronted the mill operator who found his former surplus of sawdust no longer existed, and that owing to the reduction of the quantity produced resulting from the thinner kerf of the band, that the fuel supply must be supplemented from other sources. The introduction of the "Hog " supplied the deficiency in a fairly satisfactory manner, but the expense of its operation was a very tangible item in the cost sheet, and in the designing of new mills was taken into consideration and received its due share of attention in the effort to eliminate every element possible from the cost of operating the proposed plant. The result has been that in the more recently built mills the power plant is something of which any manufacturing enterprise might be justly proud; the equipment of boilers, engine, heater, etc., being equal to those in any other line, and surpassed only by such installations as those of a public nature, as street railways, electric lighting plants, which are of a permanent character, while a sawmill is by its nature of a comparatively short-lived duration. This result has been attained almost unnoticed even by those in close and continual touch with the sawmill industry during the entire time during which the transformation has been taking place. It is true that in some of the older mills there were to be found engines that were equal in every respect to the best that was known to the mechanical practice of their day. Nevertheless they were the exception to the general custom, and the result of the eccentricity of some wealthy lumbermen who took this method of expressing the tendency of human nature to want something different and better than his neighbor.. That they were economical of steam was incidental only, and a factor that received no consideration by the purchaser; they looked better than those in common use, and therefore were chosen by those who wanted something different.

The sawmill engine room to-day, with its up-to-date equipment, supplemented with the high pressure boiler demanded by economy, represents a purely business proposition, the expenditure of money that money may be saved, and economy in the use of fuel and its product, steam, is as closely watched by the sawmill operator, as it is in other lines of manufacture.

## LINING UP THE MILL.

It may interest some inexperienced filers to know the main parts of lining up a mill, and as millwrights and filers do not agree on this subject, I will tell how I do it. I make no claim for it being the only way or the best way, but simply my way.

First, I pail a support at front end of the track, with the carriage lack at log deck. Then I fasten a line on this support and on the carriage, taking a level to plumb the line with the track iron; take either edge of the "V" track, or, if