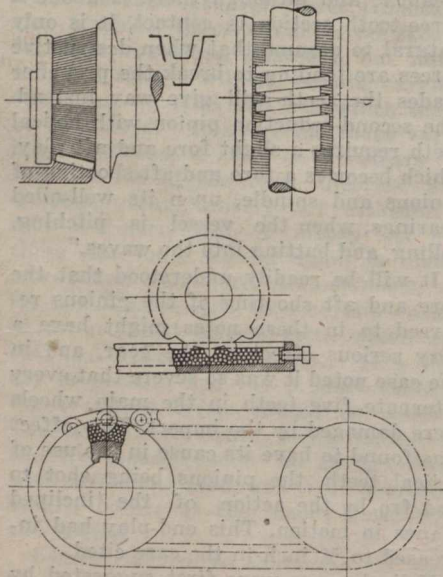


Owing to the adaptable nature of the pinion tooth, clearances are unnecessary, and the periphery of the pinion may be fitted right down to the root of the wheel tooth, thus taking advantage of all the available surface contact.

In cases where existing tooth forms are used, it is neither necessary nor advisable to fit the periphery of the pinion beyond the normal pitch circle. Wheel teeth designed to gear with this pinion should not be more than half the radial length of standard teeth, and may be less. This is a point of some importance, as, assuming the thickness to be the same, the tooth will be correspondingly stronger. It also opens up the question of pitch, but the details are too obvious for inclusion here.

Some Forms of Teeth

Figs. 8 to 20 indicate some possible forms of teeth which may be used with this pinion, but further investigation and experiment will be necessary before the best form is determined. In Fig. 20 the light lines indicate the existing standard tooth and the heavy lines the proposed tooth. The measure of adaptability secured by this new form of gear wheel permits of its being used with bevels, worms, racks, and toothed chains, and several wheels with differing tooth pitches may be driven by one pinion. Figs. 21



Figs. 20 to 24.

to 24 will render a verbal explanation unnecessary in connection with these applications.

In conclusion, a brief review of the requirements for a perfect gear and the extent to which they have been met may now be given.

The first requirement was strength, and in the new pinion there is one almost continuous tooth, composed of hard-steel wires of, say, 14 W. G., the power being transmitted by as many of these as circumstances require. The tooth of the engaging wheel is, say, half the radial length and the same thickness, and is, therefore, four times the strength of a standard tooth. It is to be noted, further, that the load is distributed over the entire surface of the tooth in full gear. So much for strength.

Unlimited durability is, perhaps, too much to ask, but in theory at least it is nearly approached. The only part of the pinion subjected to frictional motion, and therefore to wear, is the rollers. These may not only be of a very lasting material, but their combined superficial area is very considerable, and the wear is distributed over the whole of that area. Further, the rollers may wear a great deal before the mass losses the density necessary to prevent slip. Even then, the slip would appear gradually and could be corrected at the first stoppage of the machine. Without removing the pinion a few new rollers can be dropped into place as easily as dropping oil, and the pinion is thus gradually renewed. The teeth of the engaging wheel will only cease to work when they cease to exist.

The question of adaptability has already been dealt with at some length, and I will only add that experiments have been carried out on wheels with broken and missing teeth, unequally worn teeth, bent shafts, wheels eccentrically and obliquely mounted, and imperfect alignment of parts without disclosing any undesirable effects.

With reference to elasticity, this is covered for the most part, by the previous requirement, but it may be added that a mass of thin rollers with their continuous film of oil is expected to provide all the elasticity necessary. When the pinion is stationary the rollers settle down into a dead mass, but in motion the radial forces give them life, so to speak, and increase their elasticity as a whole.

Noiselessness is a very desirable quality in gears, and it may be gathered from the nature of the new pinion that any sound caused by it must be different from that of other types. All noise has its origin in vibration, and when one is absent so also is the other. Any of the new pinions which have been fitted make a sound like a stream flowing over a pebbly bed, and it decreases with increase of power.

There remains but the question of efficiency or economy of power, and at the moment, I am unable to give any figures. The pinions in use so far have been fitted for the purpose of surmounting difficulties which had previously seemed insuperable, and have proved entirely successful. In some cases it was required to engage and disengage the gears frequently while the machine was running, and this could not be done by sliding the teeth into mesh. Pinions of the new type may be moved into gear instantaneously or gradually while revolving at any speed. This is done regularly at present at a speed of 2,000 revolutions per minute without shock or danger of any kind. This fact appears to indicate adaptability, elasticity, and efficiency.

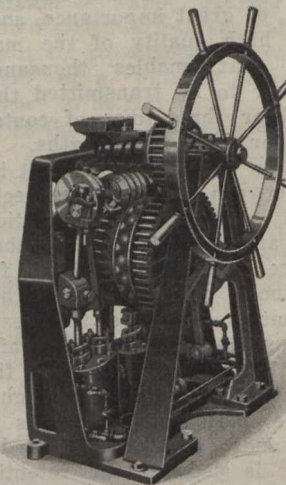
In bringing this new form of gear to your notice I have attempted to indicate a departure from the beaten track in the realm of power transmission. More than 2,000 years ago Archimedes promulgated a geometrical system upon which has been moulded the mechanical achievements of succeeding ages. The Alexandrian philosophers so broadened the fur-

rows that we can see nothing else. They led us far, and have placed us high in the realm of mechanical science, but if, in the direction of power transmission or anything else, they have led us to a dead end and imperfection, let us strike out on a new path, and, with the accumulated wisdom and experience of the past, make fresh efforts to find the ideal.

COMBINED HAND AND STEAM STEERING GEAR

The steering gear illustrated here, is arranged for small steamers and tug boats, and is so arranged that it can be used either as a hand gear or a steam gear. Owing to its compactness, it can be installed directly in the pilot house of the small vessels it is meant to be used in.

About fifteen seconds are required to



The "Little Giant."

put the helm from hard over to hard over with this gear, and an indicator is furnished which shows at all times the position of the helm. A stop is also installed, which prevents the rudder from jamming. To change from hand to steam gear requires about one minute.

The gear which is named the "Little Giant" is manufactured by the Corbett Foundry & Machine Company Ltd., Owen Sound.

The big marine boiler order received by the Engineering and Machine Works, St Catharines, Ont., will keep the boiler department of the plant going night and day for the next three months. The manager stated his plant was fully manned at present. Signs of improving business are also being shown in other industrial plants in the city and district.

In order to be able to meet the United States competition the charges for the use of Canadian dry docks on the Pacific Coast have been reduced about one third or back to their pre-war level, for the next six months, at the end of which period the question of dry docks charges will have been considered and definitely settled by the Government. The docks at Esquimalt and the floating dry dock at Prince Rupert are affected by this reduction.