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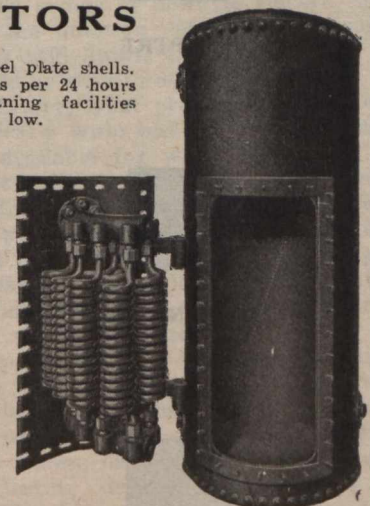
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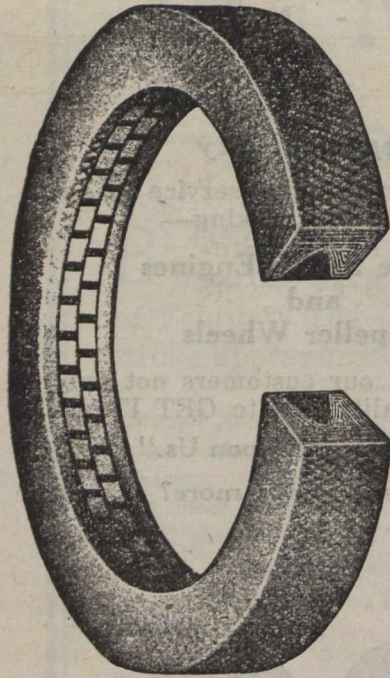
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# MARINE ENGINEERING

## OF CANADA

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### A New Form of Toothed Gearing

The Necessity of a Form of Gearing Which Would Possess Sufficient Flexibility to Adapt Itself to Distortion Such as Occurs in Marine Work, Has Brought Forward the Ideas Here Set Forth

By W. RUS. DARLING

Read Before The Institute of Engineers and Shipbuilders In Scotland

THE PROBLEMS of power transmission have occupied the minds of many succeeding generations of engineers since Archimedes discovered the properties of the lever, gave unlimited extent to the notation of numbers, and founded the method of indivisibles or exhaustions which led up to the finest discoveries in geometry, and some of the greatest modern inventions. Following Archimedes, Appollonius of Perga, who was the first to derive the conic sections from a single cone, Pappus, Diocles and Nicomedes, who invented some of the higher curves, even Diophantus, who gave us the characters used in algebra, all helped towards the determination of that little curved line which encloses the form of a modern gear wheel tooth.

The higher geometrical science was originally applied to astronomical research, and enabled Aristarcus to expand immensely the conception of the solar system. By it Hipparchus sought to explain the apparent inequalities in the motion of the celestial bodies by the hypothesis of eccentrics and epicycles. Then mechanics naturally followed

From the same geometrical sources there came later square and triangular gears, and other less familiar variable speed devices.

It is commonly supposed that the greatest mechanical discoveries are the result of chance that the most celebrated mechanicians had no theoretical knowledge and that even famous mathematicians have failed when they attempted to put their ideas into practice. It is no doubt true that chance sometimes unfolds important inventions, and that useful results do not always follow the laborious investigations of the theorist; but it is necessary for this that the productive causes be of the very simplest kind. The chance mixture of some substances gave birth to important chemical combinations; two convex lenses, placed parallel to each other at a certain distance and directed to a distant point, indicated the principle of the telescope.

#### The First Gear

History tells us that the first gear wheel was composed of flat pieces of wood, arranged in the form of a cross, Fig. 1, which were made slightly longer in one wheel of a pair. This was not for the purpose of modifying speed or power, but to ensure engagement. Subsequent developments of this idea extending over centuries are illustrated in Figs. 2, 3, and 4. In the latter the extremities of the arms are stiffened by binding, and indicate the first approach to the modern toothed wheel. Previous to 1674 teeth were of no particular scientific form, but were merely more or less regular excrescences on the rims of the wheel and pinion. About that time Roemer, a Danish mechanic, first applied the epicycloidal curve with the object of securing uniformity of pressure and velocity.

Within the last 50 years makers of clocks, watches, chronometers and mathematical instruments shaped their wheel teeth to please the eye drawing them to an enlarged scale for better discernment then reducing them to the required size. Lancashire makers of watch wheels used the bay leaf as a pattern. It was not until the works of Camus were translated from the French that wheel teeth began to take a definite

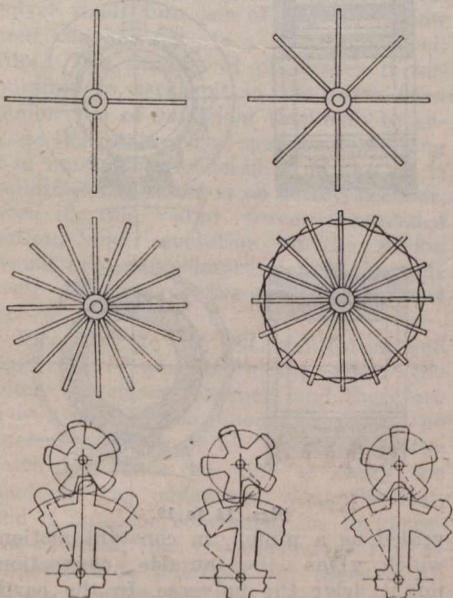
shape, and engineers and others realized that tooth designing was a science rather than an art and that only by following certain basic principles could they get uniform velocity, durability, and efficiency in their machines. Camus pointed out some of the limitations in toothed gears, for example, that pinions of a certain number of teeth were unsuitable for working with particular spur wheels, on account of the line of pressure being either outside or inside the pitch circle, Figs. 5, 6, and 7. In this connection it has long been considered unwise to have less than 14 teeth in any pinion, and in present-day work, whenever high ratios are required, involving pinions of small diameter, the teeth are made to a fine pitch with a corresponding widening of the face.

#### Tooth Pressure

This brings us down to modern times and the question of tooth pressures, which still awaits the final answer. It should be easy to determine, even in the laboratory, what pressures can be economically withstood by the various metals available for wheel teeth; but the great difficulty of maintaining, under certain conditions, the contact of wheel and pinion teeth along the whole face must be recognized, and also the possibility of intermittent point contact provided for in the design and material.

In the case of reduction gears of marine turbines, several devices have been tried, or proposed, for imparting flexibility and compensating inaccuracies of alignment and contact, but these have shown, naturally, better results in the testing department than in actual service. In so elastic a structure as a ship, no land trials can adequately indicate the behaviour of her machinery in heavy weather at sea. Even the most careful loading and trimming of cargo will leave the machinery in a different condition from that which prevails when running light. In a heavy sea there is a constant change of conditions, of torque, of alignment, of gear contacts, and of tooth pressures and it is not to be wondered at if heavily loaded gears wear more rapidly in heavy weather.

It is not proposed to make detailed mention of the best-known devices for



Figs. 1 to 7.

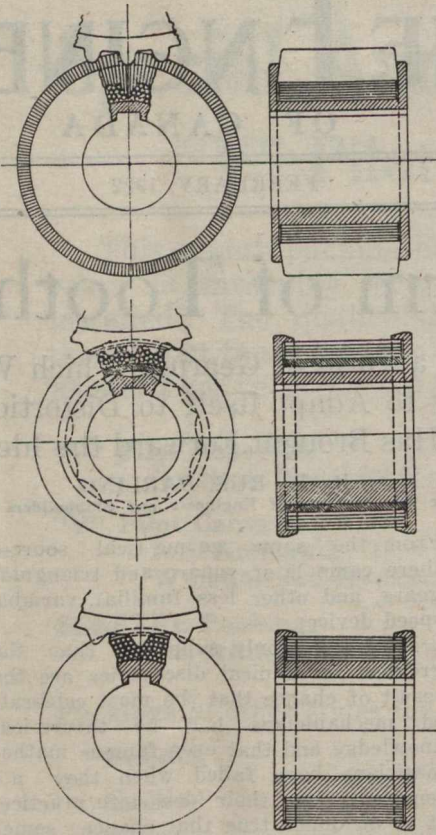
the discoveries of the great men of the Alexandrian school, and devised eccentric, elliptical, and planetary gears.

fighting these evils but some of the less familiar propositions may be of interest. From Holland comes the proposal to subject the pinion blank to the torsion at which it is expected to work when in service, and to retain it in that condition while the teeth are being cut. A special machine has been devised for this purpose, and while the idea seems practicable, it appears, at the best, to provide only for mean conditions. In the United States of America it was discovered that pinions which had lain in the store for some months before being fitted into place had become so much distorted that they had to be removed, and the teeth recut, after a brief and noisy trial run. This led to the suggestion that certain parts of machinery should be laid aside in a rough state for some time before machining, so as to get rid of internal stresses. A very sensible practice adopted in machine-tool works in Germany reminds one that more thought should be given to the prevention of gear troubles rather than to their cure. This practice is to balance all rotating parts, and, according to report, it materially reduces the noise and vibration usually ascribed to other causes.

If inaccuracies, either in the form of teeth, alignment, or balancing of parts, were the sole cause of power transmission troubles, there would be no excuse for their continued existence, but there are, and always will be, certain varying conditions on land and sea which must be conquered. To overcome these varying conditions, it may be necessary to revise some of the basic theories, and to steer clear entirely of makeshifts and half-measures. A theory is nothing else but a regular union, or methodical and connected arrangement, of all the facts relative to a certain natural or artificial effect; facts which are obtained by true experience. If a theory is perfect, and the product perfect, the resultant effect should be perfect. The tangible elements, being subject to the five senses, may be easily dealt with and eliminated, and with imperfect results before us the theory must bear the blame.

I have endeavored to outline the combination of sciences from which were evolved the modern wheel and pinion, but the new gear which I now propose to introduce comprises an element which, to the best of my knowledge, has never before been applied to practical mechanics. Before embarking upon any radical change in a time-honored theory or practice, it is well to investigate their origin and development, and determine whether the justification is to be found in an inherent or an incidental deficiency.

Figs. 8 to 19 show how the new Autopitch Gear developed in the mind of the inventor, the first form consisting of a wheel body with loose pieces of thin plate fitted close together round the rim, forming, as it were, a regularly laminated ring in the position usually occupied by teeth and their corre-



Figs. 8 to 13.

sponding spaces. It may be interesting to note how this idea originated. Having arrived at the conclusion that the old theories were unlikely ever to produce a gear which would in its own composition, cope with the varying conditions of wear, torque, alignment, expansion, etc., and that some of these conditions were natural and therefore permanent, the following list was made out to indicate requirements of a perfect gear:—

Strength, sufficient to ensure safety.

Durability, unlimited.

Adaptability, to all possible variation of conditions.

Elasticity, sufficient to absorb unavoidable vibrations of other parts.

Noiselessness, approaching to silence.

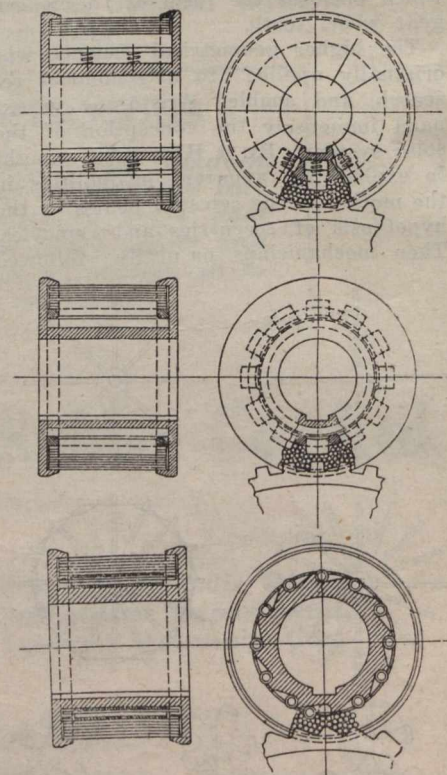
Economy, both in cost of production and in power.

The first requirement, strength, seemed to be a matter of design plus material, the second, durability, of material plus design; the third, adaptability, seemed to lend itself less to ordinary methods of solution, and was set aside for a deeper analysis; the fourth, elasticity, seemed to depend on material plus design plus mounting; the fifth, noiselessness, would appear to be covered by the fourth plus workmanship; and the sixth, economy, may be accepted as secured by the realization of the other five.

On looking over this list it was apparent that the third requirement would be most difficult to fulfil, all the others being within the scope of modern knowledge and practice. With the time-honoured principle of the wheel and pinion still guiding the mind, a careful review of the reasons why this principle

had failed to produce the desired adaptability, led to a concentration of thought on the pinion. Any trouble with the larger wheel of a pair was traced to the pinions which drive them, and it was then concluded that the solution of the problem might be found in a pinion which would have no pitch or form of teeth except that imparted to it by the engaging wheel. In other words, every driven wheel should be its own odontograph. Simple minds mould their ideas from simple patterns, and, in this instance, having come to the conclusion above stated, the next step was to find some simple basic element or principle in nature, which, when viewed in the light of centuries of thought, experience and application, might point some untrodden way to the desired end.

The old mill wheel, with its continuous stream of water "gearing" into it, suggested possibilities. The mill stream adapts itself to almost any conceivable variation of a nature corresponding with those to be met with in mechanical gears. If the mill stream could be rolled up in a circle of suitable diameter, and provided with a shaft and bearings, it would form a pinion of the required adaptability. The absurdity is, of course, apparent, but in search for a new theory, apparent absurdities must be fully considered. And this same apparent absurdity is one of the most familiar features of nature; the feature which makes it necessary to build ships instead of railways. By the same method of reasoning the earth is re-



Figs. 14 to 19.

vealed as a pinion, in constant motion, which, given the outside connection, might drive the universe. In the earth as a whole there is the embodiment of the idea of a mill stream revolving continuously round an axis. But in building

up a theory the "methodical arrangement of facts" must be complete. Imagine a paddle-steamer in a fixed position relative to the motion of the earth, and the wheels driven by the water revolving with the earth, and you have the idea of the mill stream mounted on an axis. Being in possession of a theory which appears to be sound, it remains to be seen whether it can be applied within the limitations of known or achievable practice.

It is probable that machine-cut teeth are not always correctly shaped, although the machines ensure the equality of their pitch. The bearing between opposing teeth may be only at a point, or points, instead of on a line the full width of the wheel. Even this line contact, when acquired, is not a mechanical ideal. Teeth slide as well as roll, and concentrated pressure and friction are, therefore, of great importance, and it is only the high quality of the material available that enables thousands of horse-power to be transmitted through one, two, or three lines of contact of one, two, or three feet lengths.

The value of the oil film and its existence between the engaging teeth are apparently accepted by authorities on gearing, and I sincerely hope that the acceptance is justifiable. If this film of oil is actually constant, it must be concluded that the pressure, the wear, and the transmission, are all effected through the medium of that oil film. It is estimated that in modern high-speed gears, the period of contact is about one-thousandth of a second, and from that fact is deduced the retention of the oil film.

From the foregoing it may be reasoned that the thicker the film the better, and, to carry this reasoning to its logical end, if the teeth of one wheel were eliminated and only the oil left, the theory of the endless mill-stream and the earth-driven paddle-wheel would be realized in practice. Absurd again, of course, but the question resolves itself into one of degree. How near can one get to a continuous oil film? The fluidity of oil makes it impossible to retain it in the form of a pinion rim of sufficient thickness to engage the teeth of the spur, so something else must be considered. If the oil is solidified the effect is no better, because, even if the radial forces suspended action, one revolution of the pinion would give it the impression of the spur teeth and destroy the continuity aimed at.

Reverting to the rational forms and materials of gear teeth, the finer the pitch the closer together, and therefore more nearly continuous, become the successive films of oil. If, however, the teeth are made too fine to carry the load, all the advantage would be lost, and it must be concluded, for the present at least, that the continuous film is impossible in practice; but there is an element which has not yet been considered. It is neither a fluid nor a solid, and yet possesses something of the na-

ture of both. It is sometimes called a semi-fluid, and perhaps the only familiar form of it is to be found in balls. If a number of balls are poured into a vessel they will find a common level; if run out on a table they will behave much like water.

A less familiar form, perhaps, found in rollers, and here is an element which can only flow in two opposite directions. It is this fact, this limitation, which enables it to be harnessed in the form of an endless mill-stream within the compass of an ordinary pinion, Figs. 8 to 19. These figures show how this semi-fluid can be controlled and kept in its appointed place. The density of the element may be varied by having more or less rollers in a given space, and each roller being supported by all the others; their individual diameter does not materially affect their strength as a combination, which, in fact, forms one solid "fluid" tooth, equal in thickness to almost the circumference of the pinion.

Reverting to the "absurd" proposition of a continuous oil film it may be seen how nearly approach has been made to its realization. It is at once apparent that each roller provides a line of contact with the engaging wheel tooth, so that, instead of one line of contact per tooth, there is a number varying with the depth of gear mesh. Further, each roller has a film of oil over its entire length and circumference, therefore, there is actually that continuous oil film which was previously thought absurd. Not only that, the metal-roller element upon which the film is built is almost as fluid as the oil itself.

Having now completed a brief and rugged analysis of the theory and construction of a pinion designed to fulfil certain requirements, more particularly that of adaptability to varying conditions, there remains to be set forth, in a few words, its application to power transmission and the extent to which it meets those requirements. It may be easily seen that a pinion of this construction is able to accommodate itself to any straight tooth in a wheel, and will continue to do so until the tooth is entirely worn away. It is, therefore, independent of the contour and thickness of the tooth. Also, the tooth may engage with it at any point of its circumference, and it is thus independent of pitch. These facts indicate the elimination of geometrically designed teeth as a necessity, and also, that irregularity of pitch and missing teeth will not interfere with smooth and continuous running. Further, there are no tooth clearances, and therefore no backlash. Other irregularities are provided for in the fact that the rollers are free to incline in either direction across the face. The alignment may be faulty, parts may expand or contract, the foundations may warp and twist, but the little rollers will cling to the teeth of the wheel till it is ready for the scrap heap.

It is, perhaps, at sea with double-reduction gears and turbines that "varying conditions" are most pronounced

and in this connection I will at this point introduce some notes of an expert.

#### Some Notes on Behavior

"In vessels fitted with single-reduction gearing, the teeth should not suffer from the 'shock' forces which break or tend to break propeller blades, as the teeth are sufficiently strong to safely transmit the forces to the turbine; by so doing the speed of the turbine rotors is reduced, or may even cause them to stop or reverse when the forces tending to break the propeller are great. By this action the single-gear turbine acts as a cushion to the teeth, and it is for this reason that there are many successful steamers sailing today with this type of gear. But in the case of the double-reduction geared turbine this would not be the case, as the secondary pinion spindle carries the heavy primary gear wheels, which are virtually fly-wheels humming at between 500 and 600 revolutions per minute—the effect of which is to lock and damage the teeth when the propeller blades are breaking or tending to break.

"As the section at the root of a tooth on the main gear wheel of, say 4 feet 6 inches radius is very small when compared to the section of a propeller blade at 4 feet 6 inches of a 400-foot cargo steamer, and although there is about a three-tooth section in contact, it is only natural to assume that when destructive forces are tending to break the propeller blades the teeth will give way instead. The second-reduction pinion with helical teeth requires a slight fore and aft play, which becomes a fore and aft shooting of pinions and spindle, upon its well-oiled bearings, when the vessel is pitching, rolling, and butting into the waves."

It will be readily understood that the fore and aft shooting of the pinions referred to in these notes might have a very serious effect on the gear, and in the case noted it was so severe that every alternate five teeth in the main wheels were damaged by the impact. This effect was found to have its cause in the use of helical teeth, the pinions being shot to and fro by the action of the inclined planes in motion. This end-play had increased to  $\frac{5}{8}$  inch in the case cited.

Helical gears were first suggested by Dr. Hook, of Cambridge, with the object of obtaining continuity of engagement and smoothness of action; but, in cases like that cited, these virtues are not necessarily present. From what has been said of the new gear it will be gathered that these objects are expected to be gained with simple straight teeth; it has been claimed that the Autopitch pinion will mesh accurately with any straight tooth of whatever shape or thickness, but there are, no doubt, certain forms which will give better results than others. This presents a problem more difficult to solve than that of the pinion itself. In most of the trials carried out existing wheel patterns have been used, but it is intended to make experiments with teeth of various forms, and to compare results. One important point may be mentioned.

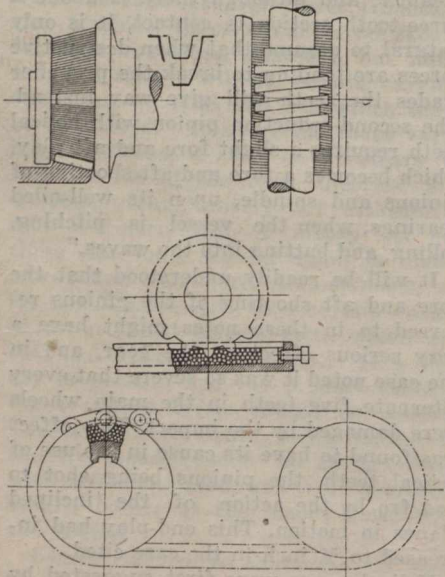


Owing to the adaptable nature of the pinion tooth, clearances are unnecessary, and the periphery of the pinion may be fitted right down to the root of the wheel tooth, thus taking advantage of all the available surface contact.

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 the 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.

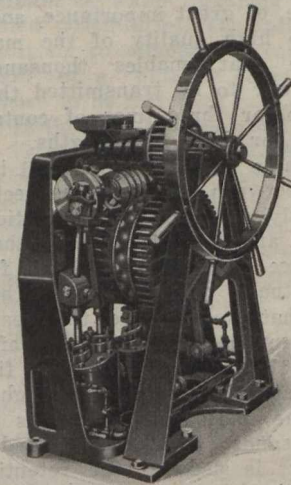
In bringing this new form of gear to your notice I have attempted to indicate a departure from the beaten track in the realm of power transmission. More than 2,000 years ago Archmedes promulgated a geometrical system upon which has been moulded the mechanical achievements of succeeding ages. The Alexandrian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

# The World's Mercantile Shipbuilding

The Summary For The Year 1921 as Compiled by Lloyd's Register of Shipping—For the First Time Since 1913 Figures for Germany Are Given

**T**HE ANNUAL Summary of the Mercantile Shipbuilding of the World, which has just been issued by Lloyd's Register of Shipping, shows that the world's total output during 1921 was 4,341,679 tons, which is a decrease of about 1½ million tons as compared with 1920, but exceeds by over a million tons the output for 1913, which was the pre-war record year for the world. The total figures comprise 167 vessels of about 1,195,000 tons to be fitted with steam turbines; they also include 151 vessels of about 1,050,000 tons built to carry oil in bulk. Of the 1377 vessels launched in the world during the year, 47 are of over 10,000 tons each. During the four years 1918-1921 the total addition to the world's merchant navies by new construction amounts to nearly 23 million tons.

Of the total tonnage launched in the world during 1921, 2,538,680 tons were built under the survey of Lloyd's Register with a view to classification with that Society, and the diagram, included in this Summary, shows that during the last 15 years nearly 29½ million tons of new vessels have been launched which were built under the supervision of Lloyd's Register. The Annual Summary draws special attention to the present circumstances, and to the immediate future, of the shipbuilding industry of the world, and points out that although the tonnage under construction at the end of 1921, viz., 4,457,093 tons, is no less than 2,722,000 tons lower than in December, 1920, even the present reduced figures are not a correct index of the position of the shipbuilding industry unless certain factors be taken into consideration, such as the very large number of vessels, included in the totals, but the construction of which is now suspended, and the fact that the orders for new vessels have been for some time and are now far below those in normal times.

The total gross tonnage of merchant vessels launched in the United Kingdom during 1921 amounts to 1,538,052 tons, of which 964,182 tons are intended for registration in the United Kingdom and 591,870 tons are for owners residing abroad. The totals for 1921 are 517,572 tons less than for 1920, which remains the record year. The total figures include 103 vessels of between 5,000 and 10,000 tons and 24 of over 10,000 tons, the largest being the *Laconia* of 19,730 tons built by the Cunard Line. Including nearly all the vessels of over 12,000 tons, 70 vessels with a total tonnage of 624,487 tons were launched which will

be fitted with steam turbines. The motor vessels launched amounted to 28 of 102,356 tons, the largest being one of about 9,500 tons. The output of the leading shipbuilding districts is as follows:—Glasgow, 358,347 tons; Newcastle, 354,813 tons; Greenock, 146,842 tons; and Sunderland 144,280 tons. The largest decrease during 1921 has taken place on the Clyde, where the tonnage launched is 175,277 tons lower than during 1920; the decrease for the Wear is 170,174 tons and for the Tees 105,013 tons. The total launched abroad during 1921 amounts to 2,803,627 tons, a reduction of just over one million tons as compared with 1920. The countries where the largest output has taken place during the year are:—United States, 1,006,413 tons; Germany, 509,064 tons; Holland, 232,402 tons; Japan, 227,425 tons; France, 210,663 tons; and Italy, 164,748 tons. The totals for the United States are nearly one million and a half tons lower than in 1920. For the first time since 1913 complete figures are available for Germany, and totals for that country include 40 vessels of between 4,000 and 7,000 tons, 13 of between 7,000 and 10,000 tons, and one vessel of about 14,000 tons. The totals for Holland, France, Italy, Denmark and Sweden are the highest on record in each case.

## United Kingdom

During the year 1921 there have been launched in the United Kingdom 426 merchant vessels of 1,538,052 tons (viz., 371 steamers of 1,429,757 tons, 28 motor vessels of 102,356 tons and 27 barges of 5,939 tons. These vessels have been built of steel with the exception of three vessels of 1,273 tons and one vessel of reinforced concrete has been launched during the year.

The output for 1921 is 517,572 tons lower than the record figures for 1920, and equals about 35.5 per cent. of the world's output for 1921, as compared with 58 per cent.

Of the tonnage launched during the year, 946,182 tons are for registration in the United Kingdom and 591,870 tons (about 38.5 per cent. of the total tonnage), are for owners residing abroad. The percentage, although slightly lower than that for the previous year, is considerably higher than the pre-war figures which, for the five years 1909-1913, gave an average of 22-1/3 per cent.

Of the tonnage launched in 1921, 134,551 tons are for Norwegian owners, 127,854 tons for French owners, 123,811 tons for Dutch owners, and 66,373 tons

for owners in the British Dominions.

## Size and Type of Vessels

The returns for 1921 show that 103 vessels of between 5,000 and 10,000 tons each and 24 vessels of 10,000 tons and upwards were launched; the following are the ten largest:—*Laconia* (19,730), *Windsor Castle* (19,000), *Conte Rosso* (18,500), *Tuscania* (17,250), *Moldavia* (16,510), *Montclare* (16,400), *Antonia* (13,920), *Esperance Bay* (13,850), *Hobson Bay* (13,850), *Moreton Bay* (13,850).

Excluding vessels of less than 1,000 tons, 38 vessels of about 250,000 tons for the carriage of oil in bulk were launched during 1921. Of these, 27 vessels of about 195,000 tons were built on the Isherwood system of longitudinal framing, besides two other vessels of 14,000 tons. The returns also include a large number of vessels designed for channel, fishing, harbor service, and other special purposes.

The average tonnage of steamers and motor vessels launched in the United Kingdom during 1921 is 3,840 tons; but if those of less than 500 tons be excluded, the average reaches 4,602 tons, compared with 4,387 in 1920, 4,006 in 1919, 4,593 in 1918, 4,993 in 1917, and 4,080 in 1916.

The great increase which was recorded last year in the use of steam turbines has been continued during 1921, when 70 vessels with a total tonnage of 624,487 tons were launched, which will be fitted with this method of propulsion and practically all of them will have geared turbines. It may be stated that all the large vessels mentioned above, and, with the exception of two, all other vessels of 12,000 tons and upwards launched during the year, are to be fitted with turbines. During the year, 28 motor vessels of 102,356 tons have been launched and 11 of them are of 5,000 tons and upwards, the largest being of about 9,500 tons.

## Output of Leading Ports

The Glasgow district occupies first place among the shipbuilding centres of the country, showing an output of 358,347 tons. Then follow Newcastle (354,813 tons), Greenock (146,842 tons), Sunderland (144,280 tons), Middlesbrough (129,559 tons), and Belfast (93,373 tons). The largest decrease as compared with 1920 has taken place on the Clyde, the figures for which are 175,277 tons lower than the previous year. The decrease for the Wear is 170,174 tons, and for the Tees 105,013 tons, while in the Barrow district an actual increase of 26,137 tons is recorded.

As regards the movement of the shipbuilding industry during the course of 1921, Lloyd's Register Quarterly Returns show that at the opening of the year 3,708,916 tons were under construction in the United Kingdom, and the March returns showed an increase of about 90,000 tons, the totals reaching 3,798,593 tons, the highest figure ever recorded in the Society's Returns. Since then a steady decrease has taken place, the figures for the end of December, 1921, viz., 2,640,319 tons, being the lowest since June 1919 and showing a reduction of 1,158,274 during a period of only nine months.

But even this great decrease does not entirely represent the actual position of the shipbuilding industry in the United Kingdom. In comparing the present totals with those for normal years account should be taken of the fact that the total returned as under construction at the end of 1921 still includes a number of vessels the completion of which has been indefinitely postponed owing to abnormal causes. Two factors of even much greater importance are, first, that the total also includes over 720,000 tons on which all work is now suspended, and, second, that so very few new orders have recently been received by the shipbuilders. The latter point may be gathered from the December Quarterly Returns which show that during the whole quarter only 55,000 tons of new vessels have been commenced.

#### Other Countries

Outside the United Kingdom there have been launched during the year 951 merchant vessels of 2,803,627 tons (698 steamers of 2,537,976 tons, 108 motor vessels of 204,286 tons and 145 sailing vessels and barges of 61,365 tons). The figures show a decrease of 1,002,415 tons as compared with those for 1920 and of 2,720,480 tons as compared with 1919, but are 1,402,898 tons higher than those for 1913, the pre-war record year. Taking the output of 1913 at 100, the figures for the last four years are as follows: 1918, 292.6; 1919, 394.4; 1920, 271.7; and 1921, 200.2.

The returns for the year includes 198 vessels of between 4,000 and 7,000 tons each; 96 of between 7,000 and 10,000 tons; and 23 of over 10,000 tons each, including five vessels of over 14,000 tons each, the largest being the Bethore, of 15,300 tons, launched in the United States. Excluding vessels of less than 1,000 tons, the figures for the year include 97 vessels, of a total tonnage of 570,692 tons, to be fitted with turbines, the great majority of which will have geared turbines. Of these vessels 67 are of over 5,000 tons each including eight of between 10,000 and 14,120 tons. The output for the year also comprises 110 steamers of about 810,000 tons built on the Isherwood system of longitudinal framing. Including 92 of these vessels of about 704,000 tons there were launched during the year 113 vessels of about 800,000 tons for the car-

riage of oil in bulk. Over 86 per cent. of the tonnage built abroad on the Isherwood system were launched in the United States.

During 1921 there were launched 108 vessels of 204,286 tons to be fitted with internal combustion engines. Eighteen of these vessels are of over 5,000 tons each, five in Sweden, three in Denmark and Germany, two each in Holland, Italy and the United States, and one in Norway; the two largest being of 8,681 and 8,654 tons respectively, built in Denmark. The total figures include a number of sailing vessels fitted with auxiliary power. The tonnage of wood vessels included in this year's total is 52,193 tons, as compared with 133,827 tons in 1920, and 1,145,582 tons in the war year 1918 when the tonnage of wood vessels launched amounted to 28 per cent. of the total output. Of vessels built of reinforced concrete, only eight of 7,950 tons were launched during 1921.

The total figures include a large proportion of barges and other craft which cannot be described as real sailing vessels. Apart from such craft there were launched abroad 96 sailing vessels of 29,220 tons, only three of which are of over 1,000 tons, the largest being a five-masted schooner of 2,300 tons, built at Portland, Oregon. The countries where the largest output has taken place during the year under review are the United States, Germany, Holland, Japan, France and Italy. The totals for these countries amount to 2,350,715 tons, and account for nearly 84 per cent. of the total output abroad.

#### United States

The output for the year 1921, namely, 1,006,413 tons, is 1,469,840 tons lower than during 1920, and over three million tons less as compared with the record year of 1920. The decrease has been general all over the country. The tonnage launched on the Pacific Coast represents 55.7 per cent. of the output for 1920; at Atlantic and Gulf ports about 38 per cent., and on the Great Lakes less than 9 per cent. Notwithstanding this great reduction the figures for 1921 still represent nearly 36 per cent. of the total output abroad.

The total figures for the United States, excluding vessels of less than 1,000 tons, comprise 33 vessels of about 228,000 tons to be fitted with steam turbines, and 11 vessels of about 35,000 tons to be fitted with internal combustion engines. Ninety-two steamers for the carriage of oil in bulk were launched with a tonnage of about 690,000 tons. Eighty-six of these vessels of about 670,000 tons were built on the Isherwood system of longitudinal framing, and in addition nine other vessels of about 76,000 tons were also built on this system.

The totals comprise 53 steamers, each of between 4,000 and 7,000 tons; 50 of between 7,000 and 10,000 tons, and 18 vessels of 10,000 tons and upwards, including the steamship Bethore, of 15,300 tons, launched by the Bethlehem S.

B. Corp., at Sparrow's Point, Md., this being, as already mentioned, the largest vessel launched abroad during 1921.

#### Germany

Figures for this country are published for the first time since 1913. During the year under review 242 vessels of 509,064 tons were launched. As compared with the output for 1913, the present figures are about 44,000 tons higher and represent over 18 per cent. of the total output abroad during 1921. Apart from vessels of less than 1,000 tons, these figures include 17 vessels of 72,777 tons to be fitted with steam turbines and seven vessels of 28,839 tons to be fitted with oil engines. The totals comprise 40 vessels of between 4,000 and 7,000 tons, 13 of between 7,000 and 10,000 tons, and one vessel of about 14,000 tons.

#### Holland

The total tonnage launched during 1921—232,402 tons—is 49,000 tons higher than the 1920 figures, and is a record. As usual, the figures for this country do not include vessels exclusively intended for river navigation. The total figures, excluding vessels of less than 1,000 tons, comprise 13 vessels, of about 81,000 tons, and also three vessels of about 12,500 tons to be fitted with oil engines. Sixteen vessels of between 4,000 and 7,000 tons each have been launched, and four of between 8,000 and 9,600 tons.

#### Japan

The output for this country—227,425 tons—is 229,217 tons less than in 1920, a reduction of over 50 per cent. As compared, however, with pre-war years, the present output still exceeds the combined figures for the four years 1910-13 by over 30,000 tons.

The 1921 totals comprise 21 vessels of between 4,000 and 7,000 tons each, eight of between 7,000 and 10,000 tons each, and two turbine-engined vessels of between 10,000 and 10,500 tons each. These figures include five vessels of 43,683 tons, which will be fitted with steam turbines, and three vessels of 21,058 tons for carrying oil in bulk.

#### France

The output for the year—210,633 tons—exceeds the totals for 1920 by 117,214 tons (125 per cent.), and is the highest ever reached in this country. The previous record year was 1902 when 192,196 tons were launched; this total, however, included over 146,000 tons of sailing vessels. The total figures include 11 steamers of between 4,000 and 7,000 tons, 11 of between 7,000 and 10,000 tons, and one of 10,741 tons. Eleven vessels of 62,882 tons will be fitted with steam turbines, including two—one of 10,741 tons and one of 4,618 tons—for which turbo-electric propulsion has been adopted.

#### Scandinavian Countries

The total tonnage launched in Denmark, Norway and Sweden amounts to 194,607 tons, which is 31,260 tons higher than the output for 1920. The increase in Denmark amounts to 16,569

tons, in Norway to 12,603 tons, and in Sweden to 2,088 tons. As regards Denmark and Sweden the present year's figures are the highest on record. The total figures include eight vessels of between 4,000 and 7,000 tons each launched in Sweden, three in Norway and two in Denmark, in which country were also launched three motor vessels of over 7,000 tons each, the two largest of about 8,700 tons each. The tonnage of steel vessels fitted with internal combustion engines launched in Denmark—45,113 tons—is the largest for any country outside the United Kingdom.

**Italy**

The total figures for this country—164,748 tons—are nearly 32,000 tons higher than those for 1920, and are the highest on record. About 25 per cent. of the total represents the output of the Trieste district. The totals comprise 23 steamers of between 4,000 and 7,000 tons and one vessel of 7,750 tons. Eight vessels of 43,620 tons are to be fitted with steam turbines, and four vessels of 24,512 tons, are built to carry oil in bulk.

**British Dominions**

The total tonnage launched in all the British Dominions during 1921, namely, 129,675 tons, is about 74,000 tons less than in 1920. The tonnage launched in Canada—78,420 tons—is less than half of the output in 1920. On the coast and on the St. Lawrence were launched 11 steel steamers of between 4,000 and 7,000 tons, and one of 7,177 tons. The tonnage launched in the other British Dominions is 51,255 tons and includes 31,453 tons launched in the Hong Kong district, and 17,408 tons in Australia. The totals for Hong Kong comprise four vessels of between 5,000 and 6,000 tons each.

**Spain**

During the year 47,256 tons were launched. The figures include two steamers of about 5,000 tons each and two turbine vessels, one of 7,000 and the other of 10,137 tons.

**Progress Abroad**

A steady decrease has taken place during the whole of 1921 in the work in hand in countries abroad. At the beginning of the year the tonnage under construction amounted to 3,470,862 tons, and at the end of December the total was 1,816,774 tons, a decrease of 1,654,088 tons. Most of this reduction is due to the decrease in the shipbuilding industry in the following countries: the United States (where at the end of December, 1920, there were 1,310,312 tons building, whereas the figures for December, 1921, are 216,428 tons) with a reduction of 1,093,884 tons; Holland with a decrease of 137,085 tons; the British Dominions 120,186 tons, and Japan 103,601.

The only shipbuilding country where the tonnage under construction at the end of 1921 appears from the figures to be considerably larger than that for December, 1920, is Italy, with an increase of about 30,000 tons. The countries abroad having the largest amount of tonnage under construction at the

end of 1921 are: Italy, 393,832 tons; France, 362,635 tons; Holland, 313,879 tons; United States of America, 216,428 tons and Japan 144,912 tons.

It should, however, be stated that the above figures referring to work in hand at the end of December, 1921, include a considerable proportion (over 22 per cent. of the total) of tonnage on which

all work is now suspended, notably in Italy and the United States. The present condition, and the immediate future of the shipbuilding industry cannot therefore be correctly gauged from the totals of work in hand unless this factor, and others already mentioned when dealing with the United Kingdom output, are taken into consideration.

**STATISTICS**

**Merchant Vessels Launched in the United Kingdom during the two years 1920-1921**

District	Steamers		Motor Vessels		Sailing Vessels & Barges		Total		Total	
	No.	Tons Gr.	No.	Tons Gr.	No.	Tons Gr.	No.	Tons Gr.	No.	Tons
Aberdeen	12	12,891	..	..	..	..	12	63,891	19	12,403
Newcastle	67	346,439	4	7,619	2	755	73	354,813	83	365,775
Belfast	14	85,917	1	7,456	..	..	15	93,373	23	117,656
Dublin	8	11,525	..	..	..	..	9	11,525	5	8,578
Dundee	9	16,440	1	300	..	..	10	16,740	10	32,797
Clyde—										
Glasgow	73	303,914	8	53,650	3	783	84	358,347	133	457,032
Greenock	33	142,970	1	3,872	..	..	34	146,842	47	223,434
Hartlepoons	6	34,101	..	..	..	..	6	34,101	16	73,221
Hull	15	31,004	1	227	..	..	16	31,231	42	30,588
Leith	9	13,071	1	3,065	..	..	10	17,036	17	36,517
Liverpool	24	50,529	2	451	1	107	27	51,087	34	46,938
Londonderry	2	12,698	..	..	..	..	2	12,698	3	21,053
Middlesbro' Stockton & Whitby	28	129,559	..	..	..	..	28	129,559	44	195,452
Newport (Mon.)	2	9,998	..	..	7	1,369	9	11,367	11	38,560
Barrow, Maryport & Workington	4	42,736	3	20,881	..	..	7	63,617	6	37,480
Southampton	15	19,233	3	948	..	..	18	20,181	16	15,655
Sunderland	30	144,280	..	..	..	..	30	144,280	67	314,454
Other Districts	20	22,452	3	2,987	14	2,925	37	28,364	42	28,022
	371	1,429,757	28	102,356	27	5,939	426	1,538,052	618	2,055,624

**Merchant Vessels Launched Abroad During 1921.**

Countries	Steel Steamers		Wood Steamers		Steel Motor Vessels		Wood Motor Vessels		Steel Sailing Vessels & Barges		Wood Sailing Vessels & Barges	
	No.	Tons Gr.	No.	Tons Gr.	No.	Tons Gr.	No.	Tons Gr.	No.	Tons Gr.	No.	Tons Gr.
Atlantic Coast	83	591,141	..	..	6	20,693	..	..	12	7,123	8	7,771
Gulf Ports	11	58,355	..	..	..	..	..	..	2	2,000	1	2,190
Pacific Coast	39	292,616	..	..	3	10,940	..	..	..	..	1	2,300
Great Lakes	2	4,084	..	..	5	7,200	..	..	..	..	..	..
British Dominions—												
Australia	6	16,918	2	490	..	..	..	..	..	..	..	..
Canada												
Great Lakes	5	11,372	..	..	..	..	..	..	..	..	..	..
Coast	12	63,836	3	820	1	388	1	714	..	..	3	1,290
Hong Kong	10	30,376	..	..	1	167	..	..	2	910	..	..
Others	4	1,749	..	..	..	..	..	..	..	..	4	545
Belgium	3	17,909	..	..	..	..	..	..	..	..	..	..
China	10	26,731	..	..	..	..	..	..	3	630	..	..
Denmark	17	30,859	..	..	13	44,828	1	285	1	200	5	1,066
Finland	4	575	..	..	641	..	4	1,540	..	..	6	1,450
France	57	204,735	..	..	..	..	..	..	7	5,740	1	188
Germany	201	467,443	..	..	22	33,333	..	..	19	8,288	..	..
Holland	86	217,624	..	..	9	13,988	..	..	3	790	..	..
Italy	33	137,427	3	1,322	5	13,561	13	4,754	..	..	31	7,684
Japan	43	227,425	..	..	..	..	..	..	..	..	..	..
Norway	28	39,985	1	351	2	9,930	4	1,192	..	..	..	..
Portugal	..	..	..	..	..	..	7	4,380	..	..	24	7,553
Spain	11	47,256	..	..	..	..	..	..	..	..	..	..
Sweden	13	29,250	..	..	8	34,729	1	530	1	450	4	952
Other Countries	7	12,686	..	..	2	1,134	..	..	..	..	7	2,085
	685	2,534,352	13	3,624	77	100,891	31	13,395	50	26,191	95	35,174

**Merchant Vessels Launched From 1892 Onwards.**

Year	UNITED KINGDOM						ABROAD					
	Steamers & Motors			& Barges			Steamers & Motors			& Barges		
	No.	Tons Gr.		No.	Tons Gr.		No.	Tons Gr.		No.	Tons Gr.	
1892	512	841,356	169	268,594	147	126,210	223	121,885				
1893	438	718,227	98	118,106	135	121,606	175	68,752				
1894	549	964,926	65	81,582	148	203,279	170	73,751				
1895	526	904,991	53	45,976	190	209,300	111	57,893				
1896	628	1,113,831	68	45,920	260	299,421	157	108,710				
1897	545	924,382	46	28,104	253	278,443	146	100,995				
1898	744	1,363,318	17	4,252	371	415,907	158	109,866				
1899	714	1,414,774	12	2,017	292	530,945	251	174,002				
1900	664	1,432,600	28	9,871	347	602,989	325	258,703				
1901	591	1,501,078	48	23,661	446	800,849	453	291,951				
1902	622	1,378,206	72	49,352	487	747,945	469	327,252				
1903	632	1,165,503	65	25,115	549	798,205	404	156,808				
1904	613	1,171,375	99	33,787	570	626,190	361	156,583				
1905	737	1,604,796	58	18,372	525	801,705	256	90,049				
1906	815	1,809,433	71	18,910	642	984,613	308	106,807				
1907*	752	1,581,521	89	26,369	681	1,070,913	266	99,285				
1908	454	914,570	69	15,099	550	791,609	332	112,008				
1909	465	972,799	61	18,267	348	564,771	189	46,220				
1910	473	1,137,738	27	5,431	453	719,903	324	94,781				
1911	700	1,782,908	72	20,936	537	748,615	290	97,781				
1912	643	1,720,957	69	17,557	720	1,074,911	287	88,344				
1913	641	1,919,578	47	12,575	639	1,269,000	423	131,729				
1914	621	1,674,358	35	9,195	473	1,111,027	190	58,173				
1915	317	648,629	10	2,290	313	518,948	103	31,771				
1916	304	607,907	2	328	506	1,032,074	152	47,771				
1917	285	1,162,496	1	400	698	1,669,608	128	105,282				
1918	300	1,344,275	1	3,845	1,397	3,996,924	168	102,400				
1919	541	1,584,920	71	35,522	1,554	5,203,712	317	320,395				
1920	581	2,039,954	37	15,670	982	3,703,030	159	103,012				
1921	399	1,532,113	27	5,939	806	2,742,262	145	613,655				

\*Prior to 1917 vessels of less than 100 tons gross were included if intended to be classed with Lloyd's Register.



**T**HE GRAIN movement from the prairies through British Columbia ports, which has played such an important role in Pacific Coast sea commerce during the last few months, is likely to undergo important changes as a result of the recent stiffening of wheat and flour rates on shipments to the United Kingdom.

Wheat shipments through Vancouver so far this season have totalled about 3,000,000 bushels, and it is expected that a similar quantity is yet to be shipped. Most of the consignments were booked at from 33 to 36 shillings, but within the last few days the figure has jumped above 37 shillings, and it has been known to go over 42 shillings in at least one case. It is the general belief that the increase is due to the desire of the United States Shipping Board to force a conference on the Pacific and Atlantic, and it is probable that a conference will be held early in the spring to eliminate the present close figuring on cargoes and establish a more uniform rate.

The result of the increased rate is that the tramp steamer is likely to have a chance again in these waters after a protracted period of dulness. A big Japanese tramp freighter has been chartered to carry a 7,500 ton cargo to the United Kingdom, although it was impossible to obtain details. The total wheat bookings to date amount to 5,000,000 bushels. The consignments for the Orient amount to 59,200 short tons and for the United Kingdom, 78,600 long tons.

The Vancouver elevator system has been severely taxed and a few days ago a delegation of Vancouver business men went to Ottawa to urge that the facilities be augmented. During the last few months the Pacific Coast has become thoroughly aroused to an appreciation of what this grain business means, and a concerted effort will be made to strengthen British Columbia's position for future development. Prairie grain brokers predict that within a few years two-thirds of the wheat output of Alberta and Saskatchewan will pass through Vancouver for either the Atlantic seaboard and the United Kingdom or the Far East, which has developed into one of the country's most important markets.

The Pacific Coast has several distinct advantages over the Great Lakes route because the winter conditions in British Columbia at no time are severe enough to hamper freight shipments. The har-

bors are always open—even Prince Rupert, which is, by the way, making an agitation for the establishment of a grain elevator there at the terminus of the Canadian National Railway (G. T. P.). There is an easy gradient over the Canadian National (C. N. R.) to Vancouver and this fact is having its effect on freight rates. A delegation headed by G. G. McGeer, K. C., and Premier John Oliver, is now in Ottawa, fighting for a revision of the freight rates in respect of British Columbia, and if its efforts are successful there is little doubt that rail business to and from British Columbia will be substantially increased. Vancouver has an advantage over Prince Rupert in that it can receive shipments direct from the prairies. Vancouver compares more equally with Fort William in that respect, although Fort William is handicapped by being locked in ice during the winter. A movement is now on foot to have the government piers and elevator at Vancouver placed under joint control so that efforts to build up the grain trade may enjoy the benefits of unification.

Development of the Peace River country in northern British Columbia and Alberta will add to the flow of grain to Vancouver later on and preparations are being made with a view to ultimate accommodation for at least 100,000,000 bushels. The Alberta crop is now about 50,000,000 bushels and the Saskatchewan output averages 200,000,000 bushels. It is believed that all of Alberta's crop and at least half of Saskatchewan's could be advantageously handled through Vancouver. Deducting 25 per cent. of this natural volume to allow for seed and milling there would be 100,000,000 bushels that should flow to the coast.

While in the Federal capital the Pacific Coast delegation will urge that the Government continue the construction of the drydocks at Vancouver and Esquimalt, which were commenced under the Meighen administration, and also the Ballantyne pier in Vancouver. Although no definite report has so far been issued to the effect that these projects would be abandoned by the new government, unofficial advices indicated strongly that such was the intention and numerous protests from Victoria and Vancouver trade bodies have been sent to the government. Now that Hon. J. H. King, Minister of Public Works, has taken office, it is expected that a definite assurance will be forthcoming that the work will go on, as Dr. King is a

British Columbian and is thoroughly familiar with local conditions.

#### Shipping Pool Contemplated

A few weeks ago there appeared to be an atmosphere of hopefulness surrounding the proposal to form a shipping pool on the Pacific Coast to purchase and operate United States Shipping Board vessels out of San Francisco, Seattle, Portland and other ports. Now that the preliminaries are over and a thorough examination made of the conditions that would at once be encountered by the proposed organization, little enthusiasm remains and it appears to be freely admitted that there is no chance of bringing about such a pool, in the near future at any rate. After several days of conference in San Francisco, a deputation of prominent Coast shipping men headed by Herbert Fleischacker and including such important figures as Captain Robt. Dollar and A. F. Alexander, president of the Pacific Steamship Company, went to Washington to discuss the plan with Chairman Lasker, of the shipping board. The Washington conference lasted two days, at the conclusion of which the deputation departed for the Coast without having reached a definite or even tentative agreement. The general impression is that the main cause of failure was the apparent impossibility of getting the factions representing the various port zones united. The shipping board, too, is hesitant about disposing of its passenger vessels, and Mr. Lasker told the deputation that it might take more than two months to determine the terms on which these ships would be released. The board is waiting to learn what Congress does with American shipping laws and subsidy proposals. In the meantime, Mr. Fleischacker has appointed an organization committee to harmonize the various port interests, if this can be done. If Congress passes new laws more favorable to American shipping, the shipping board ships will naturally command a better price, and operators will be more anxious to buy them. The Coast deputation held that present laws hampered American shipping and that ships operating under foreign laws possessed an advantage impossible to overcome.

Negotiations are now under way to stabilize freight rates to and from the Orient. Rates are now in such a state that some of the operators are not even making expenses. Operators have been allowing volume of freight to determine the rate and for that reason shippers

have had to rely a good deal on guess-work in finding the cheapest method of transportation.

#### Lumber Rates Down

Ocean freight rates on lumber cargoes from British Columbia and Puget Sound ports are now virtually open, so far as shipments to the Atlantic seaboard are concerned, and operators are taking what they can get without regard to schedules and agreements with other parties. Some months ago "a gentlemen's agreement" was negotiated setting certain rates that should govern shipments of lumber, but this has now been set aside and is no longer a factor to be observed. Within the last few days rates of \$12 a thousand have been offered, which is the lowest on record, with perhaps one exception when the W. R. Grace & Company and American-Hawaiian Company were operating heavily in the intercoastal trade and \$11 a thousand ruled for a short time. The result of the slash in rates is seen in the enormous business developed in lumber and shingle shipments from the northwest to the Atlantic seaboard. Against such competition as the water route is offering these days, the railroads are finding it increasingly difficult to obtain a share of eastbound lumber business. Tramps are again active and steam schooners are numerous in the lumber trade between the northwest and California markets.

#### Shipbuilding and Shipping

Captain M. D. Harbord, president of the Victoria (B. C.) Shipowners, Ltd., will leave shortly for Ottawa to ascertain the attitude of the Federal Government towards a continuance of wooden shipbuilding in Victoria. The Meighen Government put the shipowners on their feet two or three years ago as an unemployment relief measure by advancing \$700,000 as a loan for the construction of three wooden barquentines for the lumber trade, a sum of about \$300,000 to be raised by the sale of shares locally. The cost of the first vessel, the S. F. Tolmie, which is now engaged in the trans-Pacific trade, was considerably above the estimate and the Government declined to extend all the backing it had originally proposed. This resulted in a general shut-down in the shipbuilding operations. The company is anxious to commence again and hopes to obtain from the government an assurance that the balance of the loan will be made.

British Columbia business interests are urging the Canadian Government Merchant Marine to inaugurate a regular freight service between British Columbia and Mexico and Central America. It is held that Canadian capital is extensively invested in Mexico and that if transportation facilities were satisfactory, big orders would be placed with British Columbia firms. There is a big demand for lumber in Mexico and this could be supplied by Canada as easily as by the United States. The British Columbia Cement Company recently sent a large shipment of cement to Mexico and it is

stated that, with regular sailings arranged, important trade development could be brought about. It is also being urged that business with the Fiji Islands should be encouraged. The Canadian Merchant Marine has brought a large shipment of bananas and other tropical fruit from these islands within the last few days, and if these goods find a favorable market here there is a strong likelihood that Fijian fruit may be a big item in future shipments from the Southern Pacific.

The Canadian Robert Dollar Company's steamship Bessie Dollar, while bound for the Orient, encountered a severe storm about 600 miles off Cape Flattery a few days ago, and is now being repaired. The pilot house, bridge and other portions of the superstructure were dislocated and badly battered.

After a year of inactivity the Consolidated Whaling Company, of Victoria, will resume operations this season, and its fleet of whalers is now undergoing overhaul in anticipation of their sailing to the west coast. The first ship will probably go out in April. Last year no whaling was done off the British Columbia coast because of market conditions. The decline in prices as a result of the increasing supply of other kinds of oil made whaling unprofitable and the company's operations were closed down. The market has shown a tendency towards substantial improvement this year.

Shipping in the Far East is paralyzed to a considerable extent as a result of a strike of Chinese seamen for increased pay. There is said to be little chance of an early settlement, and the Canadian Pacific liners Monteagle and Empress of Japan are tied up as part of the idle fleet at Hong Kong. It is stated that 170 ships, most of them British, with an aggregate tonnage of 250,000, are tied up and that both ocean and river traffic are at a standstill. The Empress of Russia will also be tied up in a few days, and the Empress of Asia, which is now bound for the Orient, may be affected by the strike as well, thus tying up practically the whole of the Canadian Pacific ocean fleet.

The inquiry into the Canadian Importer disaster has been concluded, but the mystery of the near-foundering of this steamship is still unsolved. In his finding, Wreck Commissioner J. D. MacPherson strongly reprimands the captain and first officer for the manner in which they gave evidence, declaring that there was a studied reluctance to give the commission the facts of the case, and urged that a new inquiry be held as soon as possible. It is held that the officers of the ship were guilty of negligence by ignoring an elementary precaution by emptying one of the ballast tanks when the ship was already showing a decided list.

An investigation will probably be held in a few days to determine the responsibility for the collision between the C. P. R. steamer Princess Royal and the Pacific Great Eastern tugboat Clin-

ton, resulting in the sinking of the latter at the entrance to Vancouver harbor.

One hundred men are at present working at the Canadian National Railway Shipyard at Hays Cove, Price Rupert. The work going on includes an extensive overhaul of the Grand Trunk Pacific steamer Prince Albert, repairs to eight or ten fishing schooners and the construction of the Francois Lake ferry. The building of the deckhouse and interior fittings of the ferry boat has been commenced, the woodwork on the cradle being completed. The Prince Albert is being generally overhauled and surveyed for re-classification.

#### PERSONAL

Mr. William Anderson Black, of the well known Halifax shipping firm of Pickford and Black, was elected a director of the Royal Bank of Canada at a recent meeting to fill the vacancy caused by the resignation of Justice T. Sherman Rogers. Mr. Black is a very well known figure in marine circles in the Nova Scotian port, and the province generally.

There has been some talk in the Maritimes of making Mr. Wm. Duff the new Deputy Minister of Marine. Mr. Duff would be a good man for the post, having been actively connected with maritime interests for the best part of his life. It is thought that if Mr. Duff was made Minister, there would then be no need for a special minister of Fisheries. It is felt that a Maritime Province man should be the Deputy, and as there has been a rumour that Mr. Alex. Johnson would return to the British Empire Steel Corporation, Mr. Duff has been singled out to fill his shoes.

Captain J. F. Simmons has been appointed harbour master of the port of Montreal, to fill the vacancy caused by the retirement of Captain Toussaint Bourassa, who has been in the service of the Harbour Commissioners for the past thirty years. Captain Simmons has been deputy harbour master since the year 1912. His appointment was signalled by occurring on the same day as his marriage, and before taking up his new duties, Captain Simmons and his bride will take a trip to the old country for their honeymoon, lasting about six weeks.

It is announced from Montreal that Captain D. H. Pearson, who was formerly publicity agent of the Canadian Pacific Ocean Services Ltd., and later with the C. P. R. when that company took over the C. P. O. S. has been appointed editor of the British Dominions Trade, a journal devoted to the interests of Empire trade and its development. The close knowledge possessed by Captain Pearson of European and Empire affairs, on which he is a recognised authority will make him a valuable asset to the paper, and ensure his success in his new post.

# LLOYD'S REGISTER SHIPBUILDING RETURNS

For the Quarter ended December, 1921

WE PUBLISH below Lloyd's Register shipbuilding returns for the quarter ended Dec. 31, 1921. The merchant tonnage returned as under construction in the United Kingdom at the end of December amounts to 2,640,319 tons. This represents a reduction of about 643,000 tons as compared with the total at the end of the previous quarter, but under the present conditions even these reduced figures cannot be regarded as a true index of the activity of the shipbuilding industry in the near future.

In order to enable a correct comparison to be made between the present figures respecting tonnage under construction and those for normal times, two factors must be taken into consideration, viz., the large number of vessels (totalling over 720,000 tons) included in the present totals although all work on them has now been suspended; also a certain number of vessels the completion of which has been postponed owing to abnormal causes and which, in the ordinary way, would have been off the builders' hands by now and would therefore not have appeared in the present totals. As compared with the figures for the quarter ended Sept. 30, 1921, there has been a considerable increase (viz., 159,000 tons) in the tonnage launched during the past quarter, and for the first time since September, 1920, there is also a slight increase in the tonnage commenced during the quarter.

The total merchant tonnage building abroad is 1,816,774 tons, but this includes about 400,000 tons upon which work

has been suspended, leaving about 1,417,000 tons actually under construction. The country where the largest amount of work is suspended is Italy, such tonnage amounting to over 50 per cent. of the total tonnage recorded as under construction in that country. It will be seen that the tonnage building abroad is about 443,000 tons lower than the total building at the end of September, 1921. The decrease affects most countries, but specially the United States of America, in which country the tonnage now under construction is less than 5.2 per cent. of the total building there in March, 1919. The leading countries abroad are: Italy, with 393,382 tons; France, 352,635 tons; Holland, 313,879 tons; United States, 216,428 tons; and Japan, 144,912 tons.

The returns show that there are at the present time 121 steamers and motor-vessels, each of over 1,000 tons, with a total tonnage of 793,193 tons, under construction in the world for the carriage of oil in bulk. Of the total, 82 of 535,019 tons are under construction in the United Kingdom. The tonnage of vessels now building which are to be fitted with internal combustion engines amounts to 368,494 tons. Of the total tonnage given as being under construction in the world—which total excludes vessels the construction of which has not actually been commenced, and also all vessels of less than 100 tons—2,980,937 tons are under the inspection of the Society's Surveyors, with a view to Classification in Lloyd's Register Book.

## MERCHANT VESSELS UNDER CONSTRUCTION

The Returns compiled by Lloyd's Register of Shipping, which only take into account vessels of 100 tons gross and upwards the construction of which has actually been commenced, show that there were 515 merchant vessels of 2,640,319 tons gross under construction in the United Kingdom at the close of the quarter ended Dec. 31, 1921. The particulars of the vessels in question are as follows, similar details being given for the preceding quarter for the purpose of comparison:—

Description	Dec. 31, 1921		Sept. 30, 1921	
	No.	Gross Tons	No.	Gross Tons
<b>Steam.</b>				
Steel	469	2,448,371	630	3,047,964
Ferro-Concrete	..	..	..	..
Wood and Composite	3	1,912	3	1,912
<b>Total</b>	<b>472</b>	<b>2,450,283</b>	<b>633</b>	<b>3,049,876</b>
<b>Motor.</b>				
Steel	36	188,191	49	229,120
Ferro-Concrete	..	..	..	..
Wood and Composite	1	205	1	205
<b>Total</b>	<b>37</b>	<b>188,396</b>	<b>50</b>	<b>229,325</b>
<b>Sail.</b>				
Steel	6	1,640	16	3,471
Ferro-Concrete	..	..	..	..
Wood and Composite	..	..	1	300
<b>Total</b>	<b>6</b>	<b>1,640</b>	<b>17</b>	<b>3,771</b>
<b>Total Steam, Motor &amp; Sail</b>	<b>515</b>	<b>2,640,319</b>	<b>700</b>	<b>3,282,972</b>

The tonnage now under construction in the United Kingdom is about 643,000 tons less than that which was in hand at the end of last quarter, and about 1,068,000 tons less than the tonnage building 12 months ago.

These figures, however, do not represent the

work actually in progress. The total now returned as under construction includes 722,000 tons on which work has been suspended and a certain number of vessels, the completion of which has been postponed, owing to abnormal causes. These factors should of course be taken into consideration for the purpose of comparison with normal figures respecting tonnage under construction.

Of the merchant vessels being built in the United Kingdom at the end of December, 411 of 2,091,356 tons are under the inspection of the surveyors of Lloyd's Register with a view to classification by this society.

## MERCHANT VESSELS UNDER CONSTRUCTION IN THE WORLD

Where Building	No.	Gross Tons
United Kingdom	472	2,450,283
†	37	188,396
‡	6	1,640
*Other Countries	445	1,604,138
†	93	180,098
‡	73	32,538
<b>Total for the World</b>	<b>917</b>	<b>4,054,421</b>
†	130	368,494
‡	79	34,178

\*Excluding Germany, figures for which Country are not yet available.

† Steam. ‡ Motor. § Sail.

The Tonnage being built in the World at the end of December under the inspection of the Surveyors of Lloyd's Register, excluding vessels the construction of which has not actually been commenced and excluding all vessels of less than 100 tons, amounts to 2,980,937 tons.

## WORK IN HAND IN PRINCIPAL DISTRICTS

The following table gives the total figures for vessels now under construction in the principal shipbuilding districts of the country, as compared with those for the previous quarter. Each district of course includes places in the neighborhood of the port after which it is named.

District	Dec. 31, 1921		Sept. 30, 1921	
	No.	Gross Tonnage	No.	Gross Tonnage
Aberdeen	6	7,795	12	15,420
†	..	..	..	..
<b>Total</b>	<b>6</b>	<b>7,795</b>	<b>12</b>	<b>15,420</b>
Barrow, Maryport & Workington	7	64,166	8	80,793
†	2	13,986	3	20,667
<b>Total</b>	<b>9</b>	<b>78,152</b>	<b>11</b>	<b>101,460</b>
Belfast	31	321,485	40	349,600
†	..	..	..	..
‡	..	..	..	..
<b>Total</b>	<b>31</b>	<b>321,485</b>	<b>40</b>	<b>349,600</b>
Clyde—				
Glasgow	107	644,724	149	783,827
†	17	109,185	21	138,585
‡	3	990	6	1,514
<b>Total</b>	<b>127</b>	<b>754,899</b>	<b>176</b>	<b>923,926</b>
Greenock	33	180,515	47	250,264
†	3	24,300	5	34,972
‡	..	..	..	..
<b>Total</b>	<b>36</b>	<b>204,815</b>	<b>52</b>	<b>285,236</b>
Dublin	3	3,890	8	11,840
Dundee	17	57,300	20	61,800
†	1	7,700	3	8,300
<b>Total</b>	<b>18</b>	<b>65,000</b>	<b>23</b>	<b>70,100</b>
Hartlepool	15	67,405	18	89,880
Hull	13	49,787	19	60,296
†	2	357	1	227
<b>Total</b>	<b>15</b>	<b>50,144</b>	<b>20</b>	<b>60,523</b>
Leith	6	21,870	10	28,653
†	..	..	..	..
<b>Total</b>	<b>6</b>	<b>21,870</b>	<b>10</b>	<b>28,653</b>
Liverpool	26	92,200	38	111,280
†	1	120	2	268
‡	..	..	1	107
<b>Total</b>	<b>27</b>	<b>92,320</b>	<b>41</b>	<b>111,655</b>

Londonderry	2	12,000	3	17,800
Middlesbro'				
Stockton & Whitby	24	126,075	36	190,018
	† 2	8,000		
Total	26	134,075	36	190,018
Newcastle	81	510,927	97	595,163
	† 2	5,849	4	7,631
	‡ 1	.....	1	400
Total	83	516,776	102	603,194
Newport, Mon.	6	13,489	6	18,546
	† ..	.....		
Total	6	13,489	6	18,546
Southampton	20	47,929	23	56,679
	† 2	759	5	1,625
	‡ 1	250	1	250
Total	23	48,938	29	58,554
Sunderland	39	193,305	57	280,936
	† 2	10,340	2	10,340
Total	41	203,645	59	291,276

\* Steam † Motor ‡ Sail.

The three tables which follow give further details of the work in United Kingdom yards, the fourth presents statistics of work abroad. It is of interest to note that at the end of December there were under construction abroad 39 steamers and motor vessels of 1,000 tons and above with a total tonnage of 258,174, intended to carry oil in bulk. Of these vessels, 12 of 103,890 tons were building in the United States, 8 of 48,000 tons in Italy, and 7 of 50,200 tons in France.

**VESSELS UNDER CONSTRUCTION FOR ABROAD**

Country for which intended	No.	tons.
United Kingdom	343	1,911,676
Argentina	5	5,000
British Dominions	17	51,001
Belgium	4	11,260
Chili	3	16,500
Denmark	2	9,850
France	24	141,150
Greece	4	16,220
Holland	16	132,460
Italy	2	37,000
Japan	4	25,200
Norway	21	64,903
Poland	1	1,200
Portugal	—	—
Roumania	—	—
Spain	5	15,960
Sweden	1	5,170
United States	—	—
For Sale or Flag not stated	63	195,769
Total	515	2,640,319

**OTHER DETAILS**

The following details concerning the shipbuilding work of the United Kingdom during the past three months may be added:—

During Quarter ended	No.	Gross Tons.
Dec. 31, 1921		
Vessels commenced	17	54,760
	† 1	130
	‡ 1	400
Vessels launched	90	441,380
	† 7	24,974
	‡ 4	892

\* Steam † Motor ‡ Sail

**SIZE OF VESSELS UNDER CONSTRUCTION**

The following table shows the vessels under construction in the United Kingdom classified according to gross tonnage:—

Gross Tonnage	Steam	Motor	Sail
*100 and under 500	38	6	6
500 " 1,000	56	1	—
1,000 " 2,000	57	3	—
2,000 " 3,000	28	3	—
3,000 " 4,000	36	—	—

4,000	"	5,000	23	3	—	30,000	"	40,000	—	—
5,000	"	6,000	61	3	—	40,000 tons and above	—	—	—	—
6,000	"	8,000	83	11	—					
8,000	"	10,000	36	7	—	Total	472	37	6	
10,000	"	12,000	3	—	—					
12,000	"	15,000	21	—	—					
15,000	"	20,000	22	—	—					
20,000	"	25,000	4	—	—					
25,000	"	30,000	1	—	—					

\*Vessels of less than 100 tons are not included in Lloyd's Register Shipbuilding Returns.

**MERCHANT VESSELS UNDER CONSTRUCTION ABROAD**

Countries	Steamers and Motor Vessels				Sailing Vessels				Total Gross Tons	
	No.	Steel Gross Tons	Wood Gross Tons	No.	Steel Gross Tons	Wood Gross Tons	No.			
America—										
United States	27	181,793	1	250	1	2,000	5	3,255	43	216,428
Atlantic Coast	7	27,680	—	—	—	—	—	—		
Gulf Ports	1	1,300	—	—	—	—	—	—		
British Dominions—										
Canada—										
Great Lakes	—	—	—	—	—	—	—	—	34	66,469
Coast	8	14,800	1	350	—	2	3,580			
Hong Kong	5	8,278	—	—	—	5	6,100			
Others	8	29,630	—	—	—	—	—			
Belgium	4	3,556	—	—	—	1	175			
Brazil	8	25,491	—	—	—	—	—	8	25,491	
China	1	2,170	—	—	—	—	—	1	2,170	
Denmark	6	6,050	—	—	—	—	—	6	6,050	
Esthonia	26	62,620	1	450	—	—	—	27	63,070	
Flume District	3	1,701	4	790	—	13	4,040	20	6,531	
France	7	7,259	2	600	—	—	—	9	7,859	
Greece	76	352,635	—	—	—	—	—	76	352,635	
Holland	123	313,879	—	—	—	—	—	123	313,879	
Italy	74	377,977	26	9,793	—	22	6,062	122	393,832	
Japan	35	144,912	—	—	—	—	—	35	144,912	
Norway	37	60,484	1	600	2	475	—	40	61,559	
Portugal	—	—	6	3,493	—	12	4,190	18	7,683	
Spain	15	69,787	—	—	—	1	150	16	69,937	
Sweden	22	75,078	2	680	2	1,111	7	1,400	33	78,269
Total	494	1,767,225*44	17,006	5	3,580+68	28,952	611	1,816,774		

\*Including 1 ferro-concrete vessel of 2,000 tons and 3 ferro-concrete vessels of 2,950 tons. †Including 1 ferro-concrete vessel of 2,000 tons. The total tonnage building abroad includes 400,000 tons upon which work is now suspended, the country mostly affected being Italy.

**NEW CONTRACT FOR COLLINGWOOD**

A contract has recently been entered into between The Collingwood Shipbuilding Company, Limited, of Collingwood, Ontario, and the National Sand and Material Company, Limited, of Welland, Ontario, for the construction of a special type steamer for carrying sand and gravel.

The ship is 258 feet over all, 43 feet beam, 20 feet deep, and will have a dead weight carrying capacity of approximately 3,000 tons.

The vessel will be built under the rules of the British Corporation for the Survey and Registry of Shipping and will be class B.S., and will embody all the latest improvements for a ship to suck and carry sand and gravel.

The machinery and boilers are placed aft. The hold is divided into two large hoppers. These hoppers are each 60 ft. long and will carry approximately 2,000 cubic yards of sand and gravel. Between the hoppers is a space 10 ft. long which will contain the hoisting and trawling machinery.

The pump room is built forward of the forward hopper to accommodate two 8 in. centrifugal pumps direct connected to compound condensing engines having cylinders 13 and 26 in. by 14 in. stroke. The 18 in. suction from each of these pumps is direct connected to the shell 5 ft. above the keel and a special feature of this ship is the recessing of the shell plating, accommodating guides down which the outboard suction pipe flange will slide. These suction pipes are port-

able and are removed when the cargo has been loaded. The pumps discharge the material on to troughs running over the top of the hoppers. The excess water is discharged through specially designed spillways at the end of each hopper.

A special unloading device erected on "A" frames runs the full length of the hopper and accommodates large clam shell buckets. These remove the material from the hold and discharge into a special hopper amidships, the material falling on to an elevator arrangement which passes it up to a conveyor which discharges it on the dock. The space between the main hoppers at the ship's side is divided into several compartments and there is a trimming tank and fore peak tank forward. There is a dry tank under the boilers and water ballast tank under the engine room.

The captain and crew are accommodated forward and the deckhouse aft contains the dining saloon, messroom, galley, engineers, etc., etc.

The vessel is single screw and complete with all necessary auxiliary machinery, including refrigerating plant, electric light plant, special windlass, winches, etc. The main propelling engine is triple expansion surface condensing, cylinders 19, 32 and 56 in. by 36 in. stroke, taking steam from two boilers 14 ft. 7 in. in diameter by 10 ft. 8 in. long, 180 lb. working pressure, natural draft, indicated H.P. 1400.

The vessel will work in the various rivers and is being specially built to supply material for very large contracts, and is the first of her kind to be built in Canada.



# Annual Report of the Shipping Federation

**N**AVIGATION opened with the arrival of the Canadian Government ice-breaker "Lady Grey" on the 29th March, and officially closed on the 14th December, with the departure of the S. S. "George W. Clyde" for Chicago with a cargo of sugar. The first ocean arrival was the Cunard freighter "Venusia" from London, on the 21st April; and the last ocean departure was the S. S. "George R. Grove," on the 8th December.

## Volume of Shipping

The total number of arrivals was 964 vessels, representing 2,891,956 registered tons. Of this total 807 vessels with a registered tonnage of 2,598,494 were trans-Atlantic, while 157 ships of 293,462 registered tons were from the Maritime Provinces and Newfoundland. These figures show an increase of 301 vessels of 860,227 registered tons over the year 1920.

## Heavy Grain Traffic

The outstanding feature of the season's trade was the exceptionally large quantities of grain exported from this port, the total amount of which was 126,289,333 bushels, as per manifests, of which 60,920,043 bushels were carried in regular service steamers and 65,369,295 bushels in tramp vessels.

## Produce and Package Cargoes

Exports of produce compared favorably with the previous season, butter, flour and meal showing an increase, while cheese and eggs decreased slightly. Comparative figures for the two years are as follows:

	1921	1920
Cheese (boxes) ..	1,441,779	1,407,548
Butter (boxes) . .	70,369	10,357
Eggs (cases) ..	214,203	271,773
Flour (sacks) . . .	3,326,806	2,439,536
Meal (sacks) . . . .	392,207	42,975

Package trade, however, slumped seriously, and had it not been for the large exports of grain, ships would have fared very badly for export cargoes.

## Passenger Traffic

Passenger traffic both eastbound and westbound through the ports of Montreal and Quebec showed a falling-off as compared with the previous year, figures being as follows:

Westbound:		
First class .....	4,426	
Second class .....	40,174	
Third class .....	72,381	116,981
Eastbound:		
First class .....	3,514	
Second class .....	25,256	
Third class .....	38,536	67,306
Total .....		18,287

During the past year the shipping industry experienced a period of depression which has rarely, if ever, been equalled, resultant upon the serious slump in trade and commerce which has affected the entire civilized world. The more immediate cause for the lull in overseas commerce is that countries impoverished by the war have been unable to purchase commodities at the high prices demanded by producers, and the unfavorable state of exchange has resulted in further demoralizing conditions. Yet while the trade of the world has shrunk to smaller dimensions than before the war, the world's aggregate shipping which in 1914 stood at 49,000,000 tons, to-day stands at 62,000,000, so that owners necessarily have considerable difficulty in securing remunerative employment for this tonnage. They are face to face with the dilemma that owing to this scarcity of cargoes it is impossible to operate steamers except at a loss; while on the other hand, if vessels are tied up they deteriorate quicker than if kept in commission. Forced sales by auction, not only of single ships, but of whole fleets, have been seen of late, and it is feared that this drastic weeding-out is likely to continue for some months to come. Almost without exception, every round voyage of a large vessel today shows a loss of between £3,000 and £4,000, and with many of them heavily mortgaged the outlook is not reassuring. Present freights would be profitable if working costs were on a pre-war basis; but these costs are still in the neighborhood of 100% higher than before the war.

Shipowners are in the unfortunate position that they cannot create cargoes, but must simply wait for a trade revival before the position can alter materially. In the meantime, all that can be done is to husband our resources and operate vessels still more economically. Gloomy as the prospect seems to be, there is hope that ere long the tide will turn in the direction of prosperity, and this may best be expedited by co-operation of employers and employees.

## Hague Rules, 1921:

The Hague Rules, 1921 (which are printed in the body of this report) were adopted by the International Law Association in September, and represent a serious effort on the part of all concerned to come to some common agreement on the much debated question of exceptions in bills of lading.

The International Shipping Conference held in London in November last adopted the following resolution:

"That this conference representative of the shipping industry in every part

of the world, which has had before it the 'Hague Rules, 1921,' recently adopted by the International Law Association for submission to the various interests concerned in bills of lading, is of the opinion that the interests of trade and commerce are best served by full freedom of contract, unfettered by State Control. But that in view of the almost unanimous desire manifested by merchants, bankers and underwriters for adoption of the Hague Rules this conference is prepared to recommend them for voluntary international application, and if and so far as may be necessary for adoption by International Convention between the Maritime Countries, Italy and Japan, reserving the right to raise questions on the Rule which prohibits the shipowner fixing a limit of liability below £100 per package.

Canada has the Canadian Water Carriage of Goods Act, and it would be in the interest of all concerned to amend this in favor of the International Rules.

## Labor Conditions:

Labor conditions at Canadian ports throughout the year were very satisfactory. At this port, longshoremen, shipliners and checkers accepted reductions in wages about 17 per cent., while for winter season 1921-1922 at the ports of St. John and Halifax, reductions amounting to 21 per cent. and 16 per cent. respectively were effected. It is pleasing to report that throughout these negotiations the most friendly spirit prevailed, and doubtless it was this good feeling that the reductions were accepted without that bitterness which too often is the outcome of such negotiations. There was a plentiful supply of Dock Labor, notwithstanding the increased number of steamers coming to the port, chiefly owing to the fact that steamers loaded full cargoes of grain.

The Act passed by the Federal Government increasing the dues under the Sick Mariners' Act from 1½ to 2c. per ton, came into operation on the 1st January, 1921. This tax, as previously pointed out, is an unjust imposition, discriminating against the Provinces of Quebec, New Brunswick, Nova Scotia, Prince Edward Island and British Columbia, in as much as the tax is not collected on vessels trading to ports in Ontario. There is apparently no necessity for the Government increasing the tax as the official Government returns show that there is now a surplus of \$294,996.08 in this fund, and the only two countries in the world levying such a tax are Turkey and Peru. I trust our new Government will take this matter into consideration and reduce the tax to its previous figure of one and a half cents per ton, or, better still, abolish it in its entirety and leave

shipowners to care for their own sick sailors, as they are now required to do under the Shipping Acts.

#### International Shipping Conference London, England

The Chamber of Shipping of the United Kingdom convened the International Shipping Conference which was held in London, England, on 23, 24 and 25 November, 1921, for the discussion of matters pertaining to the shipping industry throughout the world. Among the subjects then discussed were the Hague Rules, life-saving appliances, carriage of deck loads, load-line, and subdivision of passenger vessels. The conference was attended by representatives of the shipping industry all over the globe, and Canadian interests were represented by Colonel W. I. Gear, whose detailed report will be found attached. Such conferences should tend to bring about more uniformity and co-operation between the respective maritime countries.

#### International Waterways Navigation And Power Scheme

The International Joint Commission was occupied during the past year in the collection of further evidence for and against proposed waterways and power scheme on the river St. Lawrence west of Montreal. A report was presented by the Engineering Board, consisting of representatives of Canada and of the United States, favoring this scheme, at a cost of \$252,000,000, to be borne by the United States and Canada. Mr. Arthur Surveyer, C.E., a noted hydraulic engineer, who has had wide experience with the St. Lawrence waterway and also with the Chicago Drainage Canal, was engaged to make a study of the scheme as put forward by the Engineering Board. His report was unfavorable, and a strongly-worded petition was filed with the International Joint Commission against the adoption of this scheme as being likely to seriously jeopardize the water levels of the St. Lawrence below Montreal.

With the proposed power development which is now planned in conjunction with the navigation scheme, no one can foretell what will be the reaction on the levels of the St. Lawrence below this port. The St. Lawrence waterway is Canada's priceless heritage, and every thing possible should be done to protect and maintain our water levels at any cost.

Colonel Hugh Cooper, a hydraulic engineer of New York, stated in his evidence before the International Joint Commission, that in his opinion the scheme for deepening the St. Lawrence was fraught with such serious engineering problems that he would be in favour of spending \$500,000 for further investigation.

Furthermore, Canada with its war debt still but slightly diminished is in no position today to even contemplate the expenditure of hundreds of millions on a scheme of this nature, the commercial value of which has not been de-

monstrated, and the cost alone must bar the Dominion from becoming involved in this gigantic undertaking. When the time comes for Canada to undertake work of such magnitude, consideration should be given to the Georgian Bay Canal scheme, which has the advantage of being entirely within Canadian territory; while, in addition, the power development derived therefrom would be entirely controlled by Canada and would be quite immune from international control. The Great Lakes-St. Lawrence deep waterway proposal, in my opinion is one not primarily of navigation but of power development.

#### Chicago Drainage Canal

Judge Landis in the United States Supreme Court issued a permanent injunction recently limiting Chicago from taking more water from Lake Michigan than that fixed by permit from the Secretary of War, which now brings to a close a chapter in a most celebrated case, involving, on the one hand, the City of Chicago, and the navigation interests of the St. Lawrence and the Great Lakes on the other. This suit was brought about to decide whether the State of Illinois, through its power to safeguard the health of its people, could use such methods as would injure the navigable international waters of the Great Lakes and St. Lawrence, of which the Federal Authorities are guardians. The result of this diversion of water has been seriously felt by the shipping interests trading to the St. Lawrence, and it has been proven that the levels of our river have subsided 9.5 inches at low water stage as a result of the illegal action of the Sanitary District of Chicago. Since this Canal was constructed in 1889, the art of sewage disposal has advanced rapidly, and there are undoubtedly further improvements ahead of us, and Chicago should not have much difficulty in the future of protecting the health and property of her citizens without diverting such a large quantity of water from Lake Michigan.

#### Aids to Navigation

The Naval Service Department without consulting shipping interests, and without issuing the customary "Notice to Mariners," closed down the radio stations at Point Amour, Pointe Riche, Cape Ray, Heath Point, Pictou and Three Rivers. That action produced consternation in shipping circles, which was followed up by strong protests. As a result of these representations, the Lighthouse Board recommended the re-opening of the stations at Pointe Riche, Point Amour, Heath Point and Three Rivers, but refused to re-open the important station at Cape Ray. Further representations were made without success. Cape Ray is regarded as an important station, being extremely valuable to vessels fitted with D.F. apparatus. It is to be hoped that the Government will see their way to re-open this station next season.

Additional direction finder stations

are being urged all along the St. Lawrence coast line. Funds have been voted so far for the erection of one at Belle Isle, but owing to the curtailment of public expenditure, it is very difficult to induce the Government to supply money for the erection of additional stations.

Two stations erected by the Government at Chebucto Head and at Cans (Halifax Harbour) are giving excellent results, and masters are very enthusiastic over the service received from these stations, claiming it is better than any they get from stations on the United States and United Kingdom sea-boards. The station at Halifax has been particularly commented on by shipmasters, as this aid to navigation makes it one of the safest and easiest ports to approach in the world, it being possible to come right up the mouth of the harbour under the foggiest conditions with absolute certainty of position.

#### Pilotage:

Pilotage conditions on the St. Lawrence, especially in the Montreal district, are, unhappily, still unsatisfactory, due to the pooling arrangement which prevails. Furthermore, two cases of refusal on the part of pilots to take out their vessels when called for occurred during the past season, and as a result of representations an investigation was held, and one of the pilots was reprimanded for his conduct. The feeling of those concerned is that the Government should relinquish its control of pilotage on the St. Lawrence and permit shipowners to engage men in whom they have the utmost confidence. This system was adopted by the Government of British Columbia with very good results, and there is no reason why it should not work equally well on the St. Lawrence. It is felt that a system under which every man depended upon his efficiency for employment would work much more satisfactory, not alone for owners, but also for pilots.

#### Canada's Immigration Policy

Canada will, in the course of the next few years be requiring thousands of immigrants to settle on her land, but by her present policy she is closing the door in their faces. There are many emigrants of good type who are going to Australia simply because of the stringent regulations which make them feel they are not wanted here. What this country wants at the present time is a broad and constructive policy for looking after immigrants, and I hope that the Government will adopt such a policy as will tend to attract the desirable class of immigrants that is being repelled to-day along with the unfit.

#### Federation Tonnage

Federation tonnage (liner and tramp) amounted to 1,043,313 gross tons compared with 929,307 for season of 1920. Regular line tonnage showed a slight decrease—662,072 compared with 684,408 for year previous. Tramp tonnage, however, showed a considerable increase the total for 1921 being 381,241 compared with 244,899 for 1920, an increase

of 136,342 tons. Canadian registered tonnage entered amounted to 135,740 tons compared with 128,642 tons for the previous year, an increase of 7,098 tons. The following table shows tonnage entered for 1920 and 1921:

	1921	1920
Regular lines .....	662,072	684,408
Tramp tonnage .....	381,241	244,899
	1,043,313	929,307

#### Departmental Relations:

In concluding this report, I wish to state that our relations with the various departments of Government continue to be most amicable, and our thanks are due to the respective officials, all of whom have given courteous attention when we have had occasion to approach them.

I also take this opportunity of thanking the members of the Executive Council for assistance rendered during the past year.

Respectfully submitted

R. W. Reford,

President.

#### THE SHIPPING FEDERATION OF CANADA

##### Office Bearers for 1922

R. W. Reford, president; J. R. Binning, treasurer; E. W. Foulds, asst. treasurer.

##### Executive Council

D. W. Campbell; W. R. Eakin; A. E. Cook; J. R. Binning, treasurer; R. W. Reford, president; E. W. Foulds, asst. treas.; A. Mackenzie; A. M. Irvine; Major P. A. Curry; R. B. Teakle.

##### Sub-Committees

**Bill of Lading.**—Col. W. I. Gear, Major P. A. Curry, J. R. Binning.

**Harbour Equipment.**—Col. W. I. Gear, Major P. A. Curry.

**Manager and Secretary.**—Thos. Robb.

List of members present at the Annual General Meeting of the Shipping Federation of Canada (Incorporated), held in the Board Room, 218 Board of Trade Building, Montreal, on February 8, 1922, at 2.30 p.m.

R. W. Reford, president representing The Robert Reford Co. Ltd.

Colonel W. I. Gear, representing The Robert Reford Co., Ltd.

Major P. A. Curry, representing White Star-Dominion Line.

J. R. Binning, treas., representing Furness, Withy & Co., Ltd.

J. W. Nicoll, representing Furness, Withy & Co., Ltd.

Yvon Dupre, representing Sincennes-McNaughton Line, Ltd.

A. A. Larocque, representing Sincennes-McNaughton Line, Ltd.

A. E. Francis, representing McLean, Kennedy, Ltd.

E. W. Fould, asst. treas., representing New Zealand Shipping Co., Ltd.

H. M. Milburne, representing Canadian Government Merchant Marine, Ltd.

C. B. Leaver, representing Imperial Oil, Ltd.

A. Mackenzie, representing Dominion Coal Co., Ltd.

H. H. Stewart, representing Elder, Dempster & Co., Ltd.

T. J. McCaffrey, representing Canada Steamships Lines, Ltd.

Thomas Robb, sec., representing Shipping Federation of Canada, Incorporated.

#### CANDIDATES SUCCESSFUL IN EXAMINATIONS

The Department of the Naval Service announce that ten (10) candidates were examined during the month of January, 1922, of which the following were successful and obtained certificate of Proficiency in Radiotelegraphy:

##### 1ST CLASS—Commercial

A. Bader, Vancouver, B.C.; S. C. Carpenter, Vancouver, B.C.; H. K. W. McKenzie, Pictou, N.S.; R. M. Semple, Montreal, P.Q.; L. P. Thurber, Wolfville, N.S.

##### Experimental

W. D. Wood, Vancouver, B.C.

#### THE SS. "KUTSANG"

The Indo-China Steam Navigation Co., has just increased its fleet by the addition of the "Kutsang" built at the Wallsend Shipyard of Messrs. Swan, Hunter, and Wigham Richardson, Ltd. The ship's name is Chinese and signifies "Increase in Luck." In spite of somewhat boisterous weather, the trials at sea, were successfully accomplished and a speed of 13.6 knots on a draught of 23½ feet was averaged over a course of 40 knots along the coast off the mouth of the River Tyne. The owners were represented during the trial trip by Captain Lake, their marine superintendent, and by Mr. C. E. Holmes, their superintendent engineer. After the trial runs the ship returned to the River Tyne to prepare for her voyage to Hong Kong under the command of Captain Liddell. The "Kutsang" has an overall length of 434 ft. and is 54 ft. wide and 31 feet deep. She carries 7,800 tons deadweight on a draught of 26 ft. 3 in. and has been built to Lloyd's highest class. On the bridge deck are quarters for the officers and engineers together with commodious state rooms and a handsome dining saloon for first class passengers. On the boat deck is accommodation for the captain and for first class passengers, smoke room and ladies' room. Second class passengers are accommodated in the poop and a hospital and dispensary are placed above the steering gear house. The sailors and firemen have quarters in the fore-castle. Refrigerating machinery is installed to keep perishable provisions in good condition. Part of the cellular double bottom of the ship is constructed to carry oil fuel as well as water ballast.

The single screw propelling machinery and boilers have been built by the Wallsend Slipway & Engineering Co., Ltd., the former being of the four crank quadruple expansion type, balanc-

ed on the Yarrow Schlick & Tweedy system to reduce vibration to a minimum. The engines are designed to develop about 3,300 I. H. P. under normal conditions in ordinary service. Many special features have been embodied in the engine room to effect an economic and efficient working, and the installation of auxiliary machinery is exceptionally complete. There are four single ended boilers 15½ ft. in diameter with a length of 12 ft. working at a pressure of 220 lbs. per square inch under Howden's forced draught. An installation for burning liquid fuel on the Wallsend-Howden pressure system has been fitted. Two sets of pumping and heating plant are provided, one being as a stand-by in case the other requires overhauling. Settling tanks and observation tanks, together with transfer pumps have been provided, with all fittings necessary for a complete oil burning installation. As the ship will run in tropical waters, special attention has been given to the ventilation of the engine and boiler rooms.

#### SAN FRANCISCO AND SEATTLE

Captain Robert Dollar, chairman of the special committee on port equalization, which announced a few days ago the absorption by the carriers of the wharfage charge of 15 cents per ton on goods moving in foreign trade over San Francisco docks, to-day (Saturday) issued a statement serving notice on the ship owners of the world that the port of San Francisco now can give them much cheaper service than Seattle. In fact San Francisco has the best managed and most economical harbor in the world, according to Captain Dollar. His statement follows:

"San Francisco in the past has made a customary charge of 15 cents per ton on merchandise both entering and leaving the port. Seattle in order to get the advantage of San Francisco a few months ago abolished their charge for commodities passing over their wharves, and instead it was absorbed by the carriers. By this means freight was diverted from San Francisco to Seattle.

"The San Francisco Chamber of Commerce recently took the matter up and called a meeting of the Harbor Board, steamship owners, and the railroads. At this meeting Captain Dollar was requested to go to Seattle and endeavor to have that port change back to the former plan of making the merchandise pay its share. However, after the meeting of steamship men and railroad officials there who wanted the old system of making the freight pay wharfage, which all considered fair and just, the harbor board refused to make any change.

At a meeting held a few days ago in San Francisco, Captain Dollar reported his failure to get the Seattle Harbor Board back to the old plan. It was therefore decided that the steamship lines and railroads should pay 7½ cents a ton each and allow the merchandise for Oriental ports to enter and leave free of

charge. What Seattle will gain by their arbitrary stand remains to be seen.

"As it stands now, ships will pay in San Francisco 7½ cents tolls (wharfage) and 35 cents for handling, or 43½ cents a ton in all. At Seattle the same service cost the ship 25 cents for wharfage and 40 cents for handling, or a total of 65 cents, being 21½ cents more than San Francisco. Besides this the railroads in Seattle have to pay 21½ cents a ton wharfage against 7½ cents a ton here, making Seattle a very dear port for operators. Shipowners throughout the world sending ships to this Pacific Coast please take notice.

"According to the new arrangement on a ship carrying 10,000 tons of cargo entering Seattle the cost would be greater by \$2,150 than at San Francisco and it would cost the railroads to handle this same cargo through Seattle \$1,750 more than at San Francisco.

"In addition to this San Francisco's wharves are equipped with railroad tracks on each side. No harbor in the world has better facilities for the rapid and economical handling of cargo and we justly claim that since our harbor has been divorced from politics that we have the best managed and most economical harbor in the world as evidenced by the net profit earned last year of \$665,782, against Seattle's deficit of \$3,837,000. Surplus is all going into new improvements.

"Furthermore our Belt Railroad only charges \$3.50 a car for hauling cars from any railroad and delivering them promptly at any of the wharves or industries located on our fifty-four miles of Belt Line tracks, which charge is absorbed by the railroads, when shipments originate at or are destined to stations served by two or more lines."

### LUXURY MOTOR BOATS

A further activity of the above company is noted in the details just published concerning a 52-foot lake cruiser which has been constructed for His Highness the Maharajah of Patiala. For this cruiser no expense has been spared to achieve the maximum of comfort together with a handsome appearance and a high degree of reliability. The vessel will be built of galvanized steel plates butt-jointed with the rivet head finished flush, to produce a clean surface. Practically all the exposed woodwork is of teak, decks fore and aft being of this wood, together with the cabin, steering shelter and hatches. The deck planks are tapered at the bow and stern instead of being laid straight. In the saloon the windows are of the sliding railway pattern fitted with sliding mosquito screens and wooden jalousies. The sliding door at the after end of the steering position gives access to a galley and pantry which is to be provided with an ice chest and a dresser with a sink, a plate warmer, and all other usual accessories. Gun racks are provided aft of the saloon and in a suitable position by the steering wheel as the boat is to be used largely for duck-shooting on Lake

Patiala. The decorations, upholstery, curtains, etc., in the saloon are being supplied by Waring and Gillow, and are to be of the very best materials obtainable. All the internal metal work will be either of silver or silver plate, and a full outfit of cutlery, glass, plate, etc., is to be of the finest quality available.

### COASTAL MOTOR BOAT

So jealously was the secret guarded by the authorities that it was not until some considerable time after the close of hostilities that the general public had an opportunity of learning something of the remarkable services rendered during the war by that invaluable addition to the British Navy—the fleet of high-speed coastal motor-boats (C. M. B.'s or "scooters") by which name they have now become familiar.

In recalling briefly the record of their achievements, from the penetration of minefields of enemy bases for reconnaissance work and counter mine laying, the hunting out and destruction of submarines, the triumphant exploits during the memorable Zeebrugge raid, to the daring attack on Kronstadt Harbor and the torpedoing of numerous Bolshevik cruisers, some idea may be gained of the extraordinary efficiency and invulnerability of these little vessels, constructed of timber less than half an inch in thickness, armed with two or, in some cases three torpedoes, in addition to depth charges and machine guns, and capable of speeds of over 40 knots.

Considering this list of successes, the subsequent decision of the British Admiralty to adopt this class of boat as a permanent arm of the Service came as no great surprise to those more closely associated with their operations during the war.

That foreign Powers have not been backward in realizing the immense possibilities for these "mosquito craft" is indicated by the announcement of the delivery to the French Navy of a second boat recently completed by John I. Thornycroft & Co., Ltd., who are responsible for the design and construction of these boats, while similar boats will shortly be running trials prior to delivery to the United States Navy Department.

Having regard to the fact that these are probably the first naval contracts to be placed by the United States Government with any firm in this country, or for many years by the French Government, a few particulars illustrating briefly the general characteristics and armament will, no doubt, prove of interest.

As an example may be taken the boat designed for the French Navy, which on her recent trials attained a speed of 41.6 knots, while carrying a load of over 10 tons.

This boat is 55 feet in length with a beam of 11 feet and draft 3 feet 3 inches. The hull is built of two skins of Honduras mahogany, the inner planking being laid diagonally and fastened to elm frames with the outer planking running fore and aft. Oiled canvas is

stretched between the two skins to ensure water tightness. A third skin worked in from the fore portion of the boat and extending to amidships, forms a step of about 3½ inches in depth on to which the boat rises as she gathers speed and so obtains a skimming action over the surface of the water. The after construction is such that when traveling at full speed, the boat is supported solely by this step and the stern portion and on a cushion of air formed between these two points.

Despite their light construction and apparent fragility, the safety and sea-going capabilities of these boats in all but the roughest of seas have been conclusively proved; the special construction providing for considerable flexibility and enabling the craft satisfactorily to withstand "pounding" in a heavy swell.

The forward portion of the boat, decked over, is devoted to the machinery space. In this there are fitted 'en echelon,' two sets of Thornycroft 12 cylinder engines, each developing 375 h. p. at 1,500-16,000 revolutions.

For starting up, a small auxiliary single cylinder engine of about 2¼ h. p. is provided driving a worm shaft through a clutch which engages the starboard engine. This auxiliary can be utilized independently when required for charging accumulators for electric lighting, etc.

Four hundred gallons of petrol carried in two tanks provide sufficient fuel for a radius of action of about 200 sea miles.

As regards armament, the 55 feet boats are fitted with two 18 inch torpedoes carried in troughs in the after portion of the boat, two depth charges, and four machine guns.

When in action, the torpedoes are released by means of levers placed close at hand to the navigator, who sights the objective through a torpedo director fitted forward of his position amidships. On being fired, the torpedo slides down the trough, stern first, into the water—the propelling motor being simultaneously started up—and runs forward to the objective; the boat meanwhile turns to port or starboard leaving the track clear.

This operation is carried out with the boat running at any required speed.

Their high speed and quick manoeuvring power render the boat a very small objective for enemy shooting and a formidable offensive weapon.

In the many engagements in which they took a prominent part during the war the percentage of casualties was very small.

Their services at the Zeebrugge Raid are dealt with fully in Captain Carpenter's recently published volume "The Blocking of Zeebrugge."

### LONG RANGE WIRELESS

During December last, the Marconi Operator on the C. P. R. steamer "Princess Adelaide," on the Ferry run between Vancouver and Victoria, picked up remarkably clearly a Wireless Telephone speech from a station in New York, which was carrying out tests at that time.

Member of the Audit Bureau of Circulations

# Marine Engineering of Canada

FEBRUARY, 1922

A Monthly Journal Dealing with Marine Engineering and Marine Activities Ashore and Afloat.

T. H. FENNER - - - - Editor  
 J. H. ROGERS - Resident Editor, Montreal  
 B. G. NEWTON - - - - Manager  
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## Motor Ship Development

THE COMING of the motor ship is evidenced by the statistics given in the summary of shipbuilding for 1921, published in this issue. There were twenty-eight motor vessels of 102,356 tons launched in this time, and eleven of them were over 5,000 tons, the largest being in the neighborhood of ten thousand.

We remember a conversation held a couple of years ago with an engineer of long experience in both marine and mechanical work, who in his time has built and designed a number of engines. He stated at that time that the internal combustion engine for large vessels would not be an accomplished fact for many years, and gave as his reason for so saying, that there would be grave difficulty in insuring them. This he thought was on account of the large number of crank shaft breakages that had taken place. There is no doubt that the development of the internal combustion engine for commercial purposes was attended with difficulty, but the advantages attending its adoption to marine work were so great as to ensure that every effort would be made to ensure success. The increasing number of these vessels would tend to show that there are no mechanical troubles existing to-day to cause any misgivings on the part of shipowners. The very name of the firms adopting the Diesel engine as motive power is a sufficient guarantee of their suitability.

We have seen just recently, a description of a compound Diesel engine, developed by Mr. Elmer Sperry in the United States. This is of course an effort after still higher efficiency. The Still engine in England promises much higher thermal efficiencies than have yet been obtained, but this would seem to be somewhat complicated for commercial use. The great field, of course, lies in the development of the internal combustion turbine, research in which direction is constantly being carried on in different countries.

The present era of dull trade and keen competition is just the setting needed for the stimulation of scientific research into more economical methods of developing power, and it would not be surprising if the year 1922 had something startling to offer on these lines.

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## Our Cargo Fleet

THE PROBLEM of what to do with our merchant marine is one that the new government will have to take up in earnest, at the new session of Parliament. The results of the past year's working show that if the fixed charges on capital and depreciation are taken into account, a loss in the neighborhood of \$8,000,000 has been suffered. In the present state of the country's finances, burdened as we are with railways which are also showing large deficits, it would seem that a bold course should be taken. The first thing that should be done is to write down the value of the ships to present day prices, which are very far below the values at which the ships stand on the country's books. The market price for that class of vessel is today about \$30 per ton, and this is a far cry from the average \$200 per ton which the fleet cost. While writing down the value would not increase the operating profit, it would decrease the fixed charges. The amount written off would of course be a dead loss to the country, but that is inevitable. In fact, the country would probably be better off if the whole amount were written off and the ships disposed of to the best advantage.

If Canada were a country that was neglected by the existing shipping firms, and was suffering from that neglect in her trade, there would be a case for the government to go into the shipping business. There is no such need, Canada being well served by a large number of shipping firms, on regular schedules, besides the usual number of tramps that turn up for seasonal requirements. The government in competing with these vessels has to accept the same rates as they do, and cannot underbid them without calling on the taxpayers of the country to make up the difference. As to the use of the ships in developing Canadian trade, we have but little faith in that. The Canadian manufacturer needs something more than shipping facilities to develop export trade, and when the export trade is in existence, there will be no lack of ships to carry it.

The fleet was born in a moment of enthusiasm, without any too careful enquiry into the needs and prospects of success, and the thing to do now is to cut the losses and get out of the shipowning business.

The Canadian government is not alone. A lot of people went into the shipowning business in the last few years who are now out of it, some of them voluntarily, and others by force of circumstance, while there are still others who are making strenuous efforts to become free of their burden.

It will be interesting to see what the government will do towards a solution of this problem.

# News of the Shipping World

**T**HE LATEST company to become owners of a motor ship is the Royal Mail Steam Packet Co., for whom the motor ship, "Loch Katrine," is now making her first voyage. She will be on the Panama Canal Northern Pacific route. The vessel which was built by John Brown & Co., Clydebank, is very similar in design to the Glen line motor ships, "Glenogle" and "Glenapp," which have been fully described in these columns in previous issues. She is of 14,000 tons, having a length of 502 feet and a beam of 62 feet. While there is a **small amount** of passenger accommodation provided, she is essentially a cargo vessel. The machinery consists of two 3,200 I. H. P. eight-cylinder engines, built by Harland & Wolff, of the Burmeister & Wain type. The cylinders of these engines are 750 m. m. diameter and 1,150 m. m. stroke, running at a speed of about 115 r. p. m., which gives her a speed of about 13½ knots when fully loaded. In addition to the main engines, she is furnished with four 100 k. w. generators, each driven by a 150 h. p. three-cylinder Diesel engine. All deck machinery is driven by electric motors, and there is also an electrically driven air compressor which is used for maneuvering purposes only. For heating the cabins and to supply an emergency steam driven air compressor a small donkey boiler is installed. The vessel is a notable example of the new style of ship which is fast becoming general in various trades throughout the world.

**A** COMMITTEE appointed by the Governing Board of the Maritime Association of the Boston Chamber of Commerce, has recently handed in its report on what should have been done in the nature of bringing into force a national shipping policy in the United States. The report is a long one, but the main conclusions may be summarized. Briefly they are as follows:—

The continuous withdrawal of the Shipping Board from vessel ownership and operation until the fleet in their possession is entirely disposed of. That while this is going on certain trades be kept open by ships under the U. S. flag, these trades including the Trans-North Atlantic, the East coast U. S. A. to East coast South America, and the Trans-North Pacific. The committee suggests that the vessels used in these trades should be of the very highest type, suitable for passenger, mail, express, refrigerated goods and general cargo. They should also be readily convertible into armoured cruisers or transports if need arose. The committee recommends to the President the revision of the navigation laws so as to allow American owners to build or purchase vessels and operate them under conditions that will enable them to compete with ships of other nations.

The Shipping Board to revert to the original purpose for which it was created, and to formulate practical plans for the encouragement of American ownership and operation of vessels, to obtain a fair share of international carriage by sea, as well as coastwise and inland traffic. The committee calls attention to the fact that a large part of the American Merchant Marine consists of wooden and otherwise obsolete vessels and recommends that these be scrapped in the same manner that any other left-over war material would be. Attention is called to the provisions of the Jones Act, and the fact that opinion is divided on the advisability of enforcing this legislation. The committee agrees that the U. S. shipowner cannot exist in competition with foreign ships unless he is given a substantial subsidy by the Government.

It would seem to take a lot of explanation to make our neighbors see that they cannot secure business in competition with other nations when their operating costs are the highest in the world. The sooner they get this fact fixed in their minds the better chance will they have to get their share of marine business. It is of little use claiming that they have the finest sailors and engineers, etc., in the world, and that they have to pay them high wages, when vessels manned by ordinary human beings who do not need feather beds in their bunks, can go out and get the cargo. We doubt very much if the farmer of the middle west and the inland states in general will enthuse very much over paying taxes in order to help the shipowner who cannot help himself.

**T**HE INDEX number of shipping freights, supplied by the Chamber of Shipping to the "Statist," shows that the number for December is 33, which compares with 29 for November. This represents an increase of 11.4 per cent. on November and 10 per cent. on October.

The increase is due to the great improvement in rates from the Plate and Brazil, and is therefore partly seasonal in character. That it is not wholly seasonal will be seen by examining the corresponding figures for November and December, 1920, when the Index Number as a whole fell from 80 to 58, and the Index Number for Argentina, Uruguay, etc., fell from 77 to 47 in one month. American freights have not been maintained at the November level, but they are still one point higher than October, at 31. There seems little doubt that a minimum point has been passed, and it may be hoped that the rise in the Index Number of shipping Freights is symptomatic of a general recovery in trade. The Index Number for the whole year 1921 is 37, and differs by less than half a point from the geometrical average of the time charter rates for the same period.

The Time Charter Rate was maintained at 30 for the third month in succession, and is thus three points lower than the Freight Index Number. The fall in retail prices continues to be more rapid than that in wholesale prices. It should be noted that while the Freights and Time Charter Rates refer to averages for the month, the "Labor Gazette" index of retail prices refers to prices on the first of each month.

Wholesale prices, as measured by the Board of Trade index number, have been 64 per cent. of the prices in 1920; and the cost of living as measured by the "Labor Gazette" index number of retail prices, has been 94 per cent. of the average for 1920.

These figures are sufficiently striking, and show that shipping has borne much more than its share of the slump in trade in what is probably the worst year for shipping on record. It is of interest to note, in this connection, that the value of a new ready cargo steamer of about 7,500 deadweight tons carrying capacity was £34 9s. per deadweight ton in March, 1920, and had fallen to £8 per ton by December last.

Taking the year as a whole, freights, whether measured by the index number or by the time-charter rates, have been 37 per cent. of the freights in 1920. As a maritime nation shipping is naturally a very sensitive barometer of the conditions of our overseas trade, and, judging from the 1921 results, the latter has reached a grievous pass. The trouble with shipping is that the tonnage afloat is largely in excess of the pre-war figure, while the world's trade has diminished consid-

erably below the old peace-time level. There are now probably over 55 million tons of serviceable shipping seeking employment, compared with 42 million tons before the war. Our chief export in bulk, and one which at one time provided the principal employment of British tramp tonnage, was coal, but exports have fallen in 1921 to 24,660,522 tons, as against 24,931,853 tons in 1920 and 73,400,118 tons in 1913. Both liner and tramp tonnage have had to cut rates considerably during the year, sometimes accepting unremunerative figures, and, despite the fall in ships' stores, bunkers, insurance and seamen's wages, losses even on cheaply-constructed and efficiently-managed ships have been frequent. The cost of loading and discharging and general port dues requires to be further reduced in 1922 if shipping is to be restored to a healthy condition.

\* \* \* \*

THE COMMISSION which was appointed in December, 1921, to determine the most efficient plans for carrying out the recommendations of the Imperial Wireless Telegraphy Committee, have now made their report. They recommend that the transmitting stations in England, Canada, Australia, South Africa, India and Egypt, should be equipped with thermionic valves, but that at East Africa, Hong Kong, and Singapore, arc stations be fitted, with space reserved for the addition of thermionic valves when found convenient. The Commission suggest the erection of a new station near Johannesburg. The thermionic valve sets should be fitted so as to be capable of transmitting continuously at hand speed and at 90 words per minute at full power for receiving at 2,500 miles. It is also recommended that the Marconi Company be invited to tender for a certain part of the equipment.

\* \* \* \*

FROM ROTTERDAM comes the news of an unusual piece of towing performed by the Dutch tugboat, "Zwarte Zee," one of the famous fleet of Messrs. L. Smit & Co., Rotterdam. The steamer "Vesta," 1,620 tons, of Flensburg, while on a voyage from Hamburg to Lisbon with a cargo of naphthalene on deck, was set on fire through the spontaneous combustion of this deck cargo. Ten of the crew and the young wife of the chief officer lost their lives, while the remainder of the crew were rescued by the trawler L. T. 1124 of Lowestoft. The

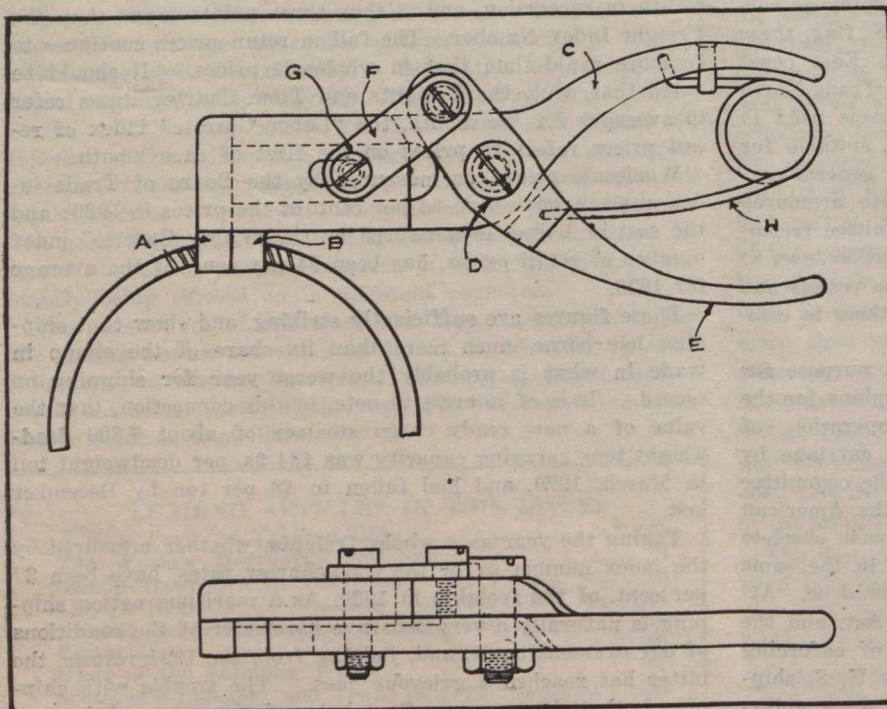
burning wreck was left to drift. Soon wireless reports began to come in from vessels which had narrowly averted collision with the derelict, with the result that the "Zwarte Zee" was sent out to search for her. She was discovered still burning about 56 miles west of the New Waterway, and the "Zwarte Zee" set about the highly dangerous task of making a line fast and towing her in. This was successfully accomplished, and the report says that the heat of the vessel's hull was so intense that the water round her hissed and boiled as she was towed into the harbor. The fire burnt itself out shortly after her arrival, having nothing left to feed on, but the whole of the cargo was destroyed, while the vessel herself was completely gutted.

\* \* \* \*

THE NEW White Star liner, "Homeric," after completing very satisfactory trials, went round from Hamourg to Southampton, and sailed for New York on her maiden trip on February 15th. The "Homeric," which is a vessel of 35,000 tons, was built for the Norddeutscher Lloyd under the name of the "Columbus," but was surrendered under the peace terms by the German Government, and bought by her present owners from the Reparations Committee. She, together with the "Olympic" and the "Majestic," will be the three White Star liners to carry on the North Atlantic trade for the immediate future.

\* \* \* \*

AN EXAMPLE of the power which the Seamen and Stewards' Union wields in Australia is given in the case of the crew of the "Moreton Bay," one of the Commonwealth Government liners. The crew were signed on in England, and at the time were assured that they would be allowed to join the Union when they reached Australia, so that their positions would be secure. However, when they reached the Colonies, the union refused them permission to join them, the result being that they were refused admission to the country on the ground that they were destitute immigrants. The owners of the "Moreton Bay," to wit, the Commonwealth Government, have therefore to carry them back to England as passengers, a somewhat expensive proceeding. In the down-under colonies a trade union has power and authority which it uses in a manner that can be called at least arbitrary.



Showing the method of using the pliers.

#### TOGGLE ACTION PLIERS

By F. M.

An unusual construction as applied to pliers is shown by the accompanying illustration inasmuch as the action of squeezing the pliers causes the jaws to open parallel with the pliers in such a way that they hold open the spring tempered ring shown in position.

These pliers consist of a pair of jaws A and B, jaw B is in part an extension of handle and frame C, attached to C by means of a pivot screw. D is a handle E, arranged in such a manner as to form a toggle. Operated by E is a link F. This is attached to jaw A by means of a screw G passing through an elongated slot in the frame portion of jaw B. In addition a spring H holds the operative handles apart, thus it is evident that by merely pushing the handles together, through the medium of link F, the jaws A and B are caused to spread apart to perform the desired function of opening the ring.

# Scotland's Industry and Trade During 1921

By G. B. JOHNSON  
Trade Commissioner at Glasgow

**S**PEAKING of Scotland's industry and trade in 1921, Trade Commissioner G. B. Johnson says that last year was a disastrous one for the steel trade in Scotland as it was in America. "It is perhaps not generally realized," he continues, "that Scotland is the largest producer of steel of any district in the British Isles. The ingot output of Scotland last year was 2,077,000 long tons. The next in order was the North-East coast of England with 1,958,000 tons, with South Wales and Sheffield following. Scotland has, however, specially cultivated the trade for high-class Siemens steel such as is required for boiler-making, shipbuilding, bridge-building, and general engineering purposes. The Continent, on the other hand, has continued to produce Bessemer quality of steel.

"The steel industry is of such national importance as was perhaps only fully realized during the war when no industry played a more important part. The great demand for war material and the necessity for extensions have enabled the industry to greatly increase its power of production. There are many plants in Scotland to-day which embody all the latest developments, and can compare favorably with any steel plants in the world, although they are not on the gigantic scale of some to be found in the United States and the Continent. The prosperity of the country largely depends upon the steel trade being maintained at the highest standard in all respects, for upon this industry in Scotland and England rests the country's position as the greatest ship owning and shipbuilding nation, as engineers in the building of railways and bridges in this and many other countries, and in the production of machinery.

## Foreign Competition

"The year commenced with falling prices and increased foreign competition through falling exchanges. In March the coal strike upset all the calculations of the makers, and plant after plant was closed down as stocks of coal became exhausted, and orders which might have been secured for the West of Scotland were picked up by Continental makers. In August when the strike was well over and coal supplies again available, prices were reduced, boiler plates to £19, ship plates to £14, and sections to £13 10s. per long ton. This action so reduced the difference between Continental and British prices, and Continental makers were so booked up with orders, that a more hopeful feeling prevailed until at a meeting of the Scottish and English Steel Association, it was

found impossible to agree to a uniform basis of prices for the two districts. Since that time Scottish producers have been competing with English in the other's territories, and with each other, and some very low quotations have been made. In the export trade, competition from the Continent has been much less severe during the last three months.

## Machinery and Engineering

In this branch of industry the past year has followed the course of trade in general. The marine engine section, the most important and in regard to which the Clyde is so pre-eminent, is so closely allied with Clyde shipbuilding, that the fortunes of one tell the tale of the other. There are many other important sections such as the building of locomotives, mining machinery, and machinery for the manufacture of rubber goods, sugar and paper. An important firm who specializes in making rubber and paper machinery recently informed the writer that the year just past was the worst in their long history.

"As far as the shipbuilding industry on the Clyde is concerned, it has suffered a period of stagnation during 1921 from which there seems to be no immediate escape. As one expert says, it has been a year of cleaning off old contracts, and new work has been very slow in coming forward. The general depression has of course, been mainly responsible, with the result that ships have been laid up by the hundred in all parts of the world through lack of demand for cargo space and new ships have not been wanted. Continental competition has also been severely felt, mainly in the departments of repair and overhaul, as their quotations were usually lower.

"It was realized early in the year," continues Mr. Johnson, "that the demand for new ships, apart from other reasons, would not revive until costs of production more nearly approached the market value of ships. Then the attempt to reduce costs, including wages, resulted in numerous strikes, one of which, that of the shipyard joiners, lasted nine months. Whether these strikes opened the eyes of both sides in the dispute to the urgent necessity of introducing good will instead of strife into their mutual relations in order to save their industry, or whether the loss of contracts to the continent and great unemployment demonstrated the necessity of lower costs, it is a fact that there is a new spirit of give-and-take in this industry as well as in others. Wages have been substantially reduced, profits have vanished, the cost of steel is lower, but it is said there is even yet too wide a margin between quotations and the prices

which shipping companies can pay and earn dividends.

"The awarding of three of the four super-Hood battle-cruisers to Clyde firms, together with most of the machinery, was a bright spot in the year's gloom; but the position of affairs brought about at the Washington Conference quickly put an end to hopes in that respect. It is perhaps not remarkable especially, but at any rate is worthy of note, that the cancelling of these contracts by the Admiralty was received in such good spirit as was the case. The general relief at the savings to the taxpayers of such large sums as these ships involved easily outweighed any disappointment at the cutting short of local benefits.

"The complete absence of anything in the nature of parochial spirit in the newspapers in this regard was conspicuous. The circulation locally of £30,000,000 of money, which these ships were expected to cost, would have relieved unemployment to a useful extent. But as a gentleman closely concerned with this industry remarked to the writer, the building of the warships was, after all, only an item, although an important item, in Clyde shipbuilding.

## Motor Ships

"An interesting feature of the year was launching of nine motor ships. The internal combustion engine has made great headway at sea, as is indicated by the fact that at present there are several hundred ships so equipped. Hitherto this type of engine has not been applied to passenger-carrying ships, but one of the nine above mentioned, and the first of its kind, is the motor passenger liner, the Domala, built for the British India Steam Navigation Company for trade between London and India. This liner can accommodate 140 passengers in addition to 11,000 tons of freight. Her two oil engines develop 4,660 h.p., and her fuel consumption at 13½ knots is estimated to be 20 tons of oil daily. This ship sailed in December from London on her maiden voyage. She is equipped to carry enough oil for the round trip—a decided advantage compared with a coal-burning ship whose bunkers have to be replenished several times on the same journey.

"No immediate improvement in shipbuilding can be discerned, but it should be remembered that building ships is not a basic industry, and any improvement must follow a demand for cargo space, which will come from a trade revival requiring the movement of commodities. The launches on the Clyde in 1921 numbered 408, comprising a tonnage of 512,137 with an indicated horsepower of 493,530."





# MARINE NEWS FROM EVERY SOURCE

**Victoria, B. C.:**—The court of enquiry into the disaster to the "Canadian Importer" in the Pacific last year, has severely reprimanded the Captain and chief engineer of the vessel, both of whom are held responsible for the accident. Some strong words were used by the wreck commissioner in speaking of the manner in which the evidence of the captain and chief engineer was given. The report says: "It was obvious that that evidence was given reluctantly with an indifference that almost amounted to defiance, but clearly with the studied object of suppressing the real cause of the disaster."

**Toronto:**—Captain James Young, who had been retired from service for some years, was found dead in his room at 62 Ascor Avenue recently. The deceased gentleman was of advanced years. Death was due to suffocation by gas, one burner of the gas stove being turned on without being lighted. Suicide was indicated by the circumstances.

**Collingwood:**—The Collingwood Shipbuilding Co., have secured a contract from the National Sand & Material Co. Ltd., for the construction of a sand and gravel carrier with a capacity of about 2200 cubic yards. This vessel will be the largest of her kind on the Great Lakes. Her capacity will be about four times that of the "Baxter Dick" or the "O'Connor Dick" the present vessels of the fleet. It is interesting to note that according to reports, the vessel could have been built in Scotland at a much less cost, but as she will be used on public works contracts, the company felt in view of the prevailing unemployment she should be built in Canada.

**London:**—It is stated here that the Canadian Government Merchant Marine will shortly establish a monthly service from Canada to the Mediterranean, in spite of the strenuous competition which is being waged by the U. S. Shipping Board. Mr. E. G. Laing has been sent as special representative to Naples, and offices have been opened in Paris, Antwerp, Hamburg and Rotterdam.

**Picton:**—As a sequel to the sinking of the "Oliver Mowat" with the loss of three lives by the steamer "Keywest," which took place last September, the captain of the latter steamer has been found guilty of negligence and sentenced to jail for twenty-one days. The captain has also had his master's certificate cancelled. He is but twenty-eight years of age.

**Sault Ste Marie:**—The car ferry Chief Wawatam recently reached Mackinaw City after a trip which included a thirty hour battle with heavy pack ice in the Straits of Mackinac. The straits had been swept by a northwest gale.

**Toronto:**—It is stated that the "Turbinia" of the Canada Steamship Lines will be put on her old route between Toronto and Hamilton when the season of 1922 opens up. The "Turbinia" has been absent from her accustomed haunts for quite a while, she having been over to Europe during the war.

**Ottawa:**—The offer of the Royal Mail Steam Packet Co., to provide a service between Canada and the British West Indies every fortnight, in consideration of a 7½ per cent guarantee on the capita cost of the ships to be used, has been refused by the Canadian Government. The Government refused on the grounds of the possible heavy cost. The same kind of service as prevails at present will be continued, the subsidy being \$340,666.66 per annum.

**Montreal:**—It is stated by those in the know that navigation will be late in opening this year. There is much more ice than usual in the river and much less open water. It is not expected to be earlier than April 15th that the official opening will take place.

**Toronto:**—The Canadian Navigator's Federation held their meeting here early this month, at which nominations for officers for the coming year were received. Ballots will be mailed to the members and the results will be announced at the general meeting to be held early in March. The officers are at present Capt. McIntyre, Collingwood, President. Capt. R. D. Simpson, Owen Sound, Secretary. Capt. F. A. Cook, Treasurer, Toronto.

**Washington, D. C.:**—In accordance with the convention for safety of life at sea adopted in London in 1914, the U. S. Coast Guard steamer "Seneca" will leave New York some time this month for ice patrol on the Grand Banks of Newfoundland. She will on this duty locate the position of fields and bergs of ice, which might be a danger to vessels in their track.

**Port Washington, B.C.:**—The Dominion Government have placed a contract with the Vancouver Pile Driving and Contracting Co., Vancouver, for the con-

struction of a wharf on North Pender Island.

**Prince Rupert, B. C.:**—The Government of the Province of British Columbia have placed a contract with the Prince Rupert Dry Dock Co., for the construction of a ferry, the cost to be \$75,000.

**New Glasgow:**—Mr. George McDougall read an interesting paper before the Cape Breton branch of the Engineering Institute of Canada at their regular meeting on Feb. 11th, the subject being "Shipbuilding." A good number of members were present, and at the conclusion of the meeting a hearty vote of thanks was tendered Mr. McDougall.

**Halifax:**—Speaking of the rumour that the Halifax Shipyards would be sold M. J. E. McLurg said at Halifax recently "The Halifax Shipyards will not be sold to Henry Ford, the C. P. R. or anybody else. There are no negotiations pending to form the basis for such a rumour. I heard it several weeks ago and do not know from whence it came."

**Sault Ste. Marie:**—The car ferry "Chief Wawatam" was caught for the third time this season in the ice of the Straits of Mackinac, and rail communication between the upper and lower Michigan peninsulas was interrupted. No discomfort was suffered by the passengers aboard, though no doubt the delay caused inconvenience.

**Belleville:**—The local Chamber of Commerce are taking steps to interest a Steamboat Company in supplying a service on the Bay of Quinte this season.

**Sarnia:**—The ferry boat "Louis Philippe," of Montreal, lying in Sarnia Bay, will be used by the Northern Navigation Company as a ferry between Sarnia and Port Huron this season. She will be the first boat of the company's fleet. The Northern Navigation Company are planning to spend in the neighbourhood of \$100,000 on the freight sheds at Point Edward to take care of an additional freight contract secured by them, which will amount to 150,000 tons a year, and give employment to about 300 men.

**Montreal:**—The cancelling of the contract for the new ice breaker which was to be built by the Canadian Vickers Ltd., and the purchase instead of the ice breaker "John D. Hazen," will mean a saving to the Government of over \$1,000,000, reports from Montreal state.

### GERMAN SHIPPING IN 1921

#### A Year of Satisfactory Accomplishment

For German maritime shipping last year was a period of development, during which the process of reconstruction initiated in the previous year was steadily continued. The characteristic features of the year were constant additions to the German mercantile tonnage, especially by the repurchase of ex-German ships from the Entente, enormous increases of capital by all the leading navigation companies, and the resumption of services to all parts of the world which had been suspended during the war, while in many instances ships that had been chartered for the purpose of carrying on these resumed services were replaced by German-owned vessels. The leading idea in Hanseatic shipping, says the *Hamburges Nachrichten*, was that it was imperatively necessary to place at the disposal of the country's foreign trade as quickly as possible German steamship lines run by German steamers, as they recognise that in the matter of economic reconstruction foreign trade and shipping are bound together very closely.

In the process of reconstruction of the German mercantile marine, however, many difficulties were encountered. In the first place, the shipping community was badly disappointed by the outcome of the negotiations with the Government on the question of compensation for war losses and the handing over of German merchant ships under the Peace Treaty. The amount of compensation that was agreed upon between the Reich and the representatives of the shipowners was, as will be recalled, only sufficient to rebuild one-third of the pre-war tonnage. But the hopes based merely on that assumption proved to be illusory, because of the sudden and very serious depreciation of the mark, which caused an enormous increase in the price of new tonnage. The instalment of the compensation money allotted for the first year was exhausted in the first few months, and at one time it looked as if the shipbuilding industry would have to come to a standstill or go on short time. As, however, owing to the constant extension of their overseas lines, the German steamship companies were in urgent need of new tonnage, some methods had to be found for achieving the object.

One after another, the leading companies announced new capital issues, and so far did this movement go that during the year 13 companies added a total of no less than 975,500,000 marks to their share capital. In every case the reason given for these increases was the acquisition of new flooring material. In several cases, besides ordering new steamers, certain companies found themselves able to repurchase a number of steamers that had been handed over to the Entente.

Another factor in the process of reconstruction was the so-called concen-

tration movement which consisted in groups of companies working various lines in common for their mutual benefit, thus reducing working expenses very considerably. Successful efforts were also made to interest other branches of German industry, which had been able to make large profits during the war, in the rebuilding of the mercantile marine. Thus arose a close association between Hanseatic shipping and the German iron and steel industry, and to some extent also with the electrical industry. Between various companies whose spheres of operation were almost identical "community of interest" agreements were arranged, with the idea of eliminating wasteful competition and reducing operating expenses. Typical of this movement was the close association of the Africa lines and the working together of the Hamburg-America Line and the Norddeutscher Lloyd in the South American and Far Eastern trades.

#### Extension of Overseas Service

Thanks to this close co-operation for their mutual benefit the German steamship companies were enabled during 1921 very considerably to extend their overseas services. Thus the Hamburg-America Line and the Norddeutscher Lloyd each introduced a regular service to South America, which they are now working in conjunction with their U. S. associates. Furthermore, the Hugo Stinnes Shipping Company opened a new line to South America, though this action led to a quarrel with the Hapag, with the result that Herr Stinnes was not re-elected to the board of the Hamburg-America Line, while the latter dissolved its connection with the Stinnes concern. The dispute which thus arose has not yet been settled.

In the North American trade the relations between the Hamburg-America Line and the Harriman concern were extended. The Hamburg company was able to exercise its right to introduce its own ships on the North America line, and the service is now being run by an equal number of German and American ships, in accordance with the terms of the original agreement. The North American service of the Norddeutscher Lloyd was affected by the bankruptcy of the Bremen company's U. S. partners, the United States Mail Steamship Company. It is, however, decided to create an independent service of its own to the United States, and this, it is announced, will very shortly be in operation. In connection with the services between Germany and the United States, it may be mentioned—though this matter does not actually belong to last year—that a member of the Roosevelt Steamship Company is reported to be on his way to Germany in order to have a meeting with Herr Hugo Stinnes. But whether the latter is proposing to extend his shipping interests to North America remains for the future to show.

In the traffic to the West Coast of South America the Kosmos Steamship

Company extended its services last year, working in conjunction with the Bremen Roland Line. The German-Australian Steamship Company entered into an agreement with a Dutch company for the joint working of its service between the Continent and the Dutch Indies. The Hamburg-America Line and the Norddeutscher Lloyd resumed their services to the Far East, and are working them in close association with the Bucknall Steamship Company. This means a renewal of the so-called East Asiatic Conference.

Very considerable also was the extension during last year of the German services to Africa, in which the Woermann Line, the German East Africa Line, the Hamburg-America Line (Africa service), and the Hamburg-Bremen Africa Line are participators. On the various lines to the Cape run by these companies four steamers per month are despatched.

Thus German shipping can look back to a year of satisfactory accomplishment in the face of numerous difficulties, and, to quote the observation that is made in various shipping journals it begins the year 1922 "in a difficult but not altogether hopeless position."

The following figures have been courteously supplied by the Dominion Bureau of Commerce of Ottawa. These figures represent quantities exported during the 12 months ending January 1921.

Aluminum, Ingots, etc.	176,774 Cwt.
Asbestos, .....	188,792 Tons
Brass and old scrap .....	32,274 Cwt.
Nickel .....	572,437 Cwt.
Silver .....	12,120,433 Ozs.
Printing paper .....	15,233,214 Cwt.

The following represents the total amount of metals, etc. exported.

Copper .....	\$15,343,864
Gold .....	3,500,511
Iron and Steel .....	16,593,108

The rubber export for the same period shows \$12,556,915.

Five hundred American manufacturers built or leased plants in Canada during the past five years at a total investment of \$150,000,000. Up to date Canada has 14 passenger cars and 13 motor manufacturers.

Seeing that Canada has only 5% of the world's population it is very interesting to note the following figures.

Canada produces 90% of the world's Cobalt, 88% of its Asbestos, 85% of its Nickel, 32% of its Pulp Wood, 20% of its Lumber, 20% of its Cured Fish, 18% of its Oats, 15% of its Potatoes, 12% of its Silver, 11½% of its Wheat, 11% of its Barley, and 4% of its Gold.

It is very interesting to note that the census of the decade ending 1911 shows an increase of 1,835,328 population in the Dominion of Canada. Considering the census taken of the decade ending 1891 the increase only showed 508,429. It is expected that the difference between the increases of the two decades will be twice the number of the former increase.

# Cutting a 3 in. Keyway in a 16½ ft. Propeller

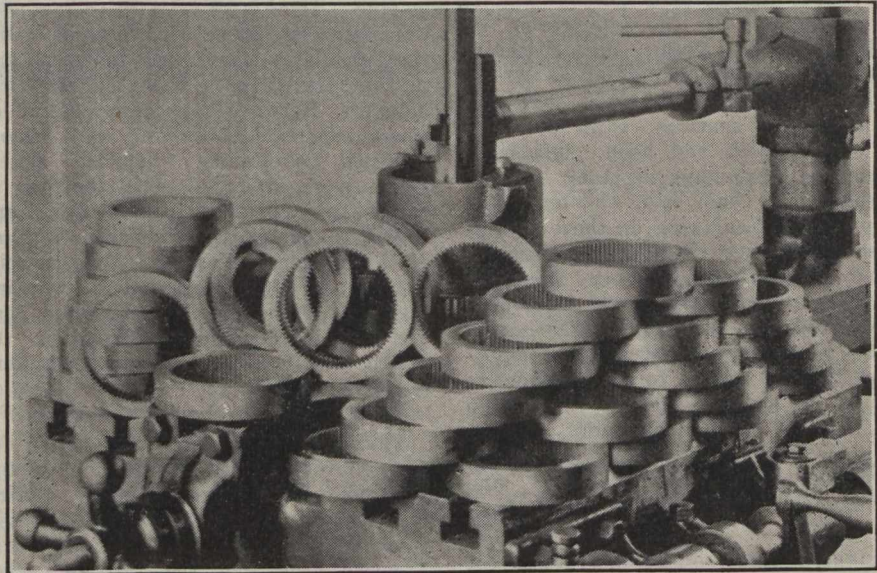
The Modern Keyseater Has Many Refinements—Quick Holding Fixtures are Big Asset—Rotary Tables Help to Speed up Work—Various Examples of Parts Completed on Keyseater

By J. H. MOORE

PERHAPS one of the most misunderstood machines existent at the present time is the keyseater. Like the hack saw, the keyseating machine has shown wonderful development within the past twenty years. Who would think of comparing an up-to-date rapid cutting metal saw, with the old fashioned frame that slowly and methodically almost rubbed its way through a steel bar?

Of course such a comparison would be ridiculous, and to speak of the modern keyseater as a tool to be used on rare occasions only, is likewise out of all reason. From a small, light constructed, and sometimes inaccurate machine, the keyseater has now reached the point where it can be classed as a production tool. In many plants, batteries of such machines are busy all day long on various work that twenty years ago would have been considered too good to trust to a mere keyseating machine. In other words they have proved their usefulness and adaptability to modern production methods. Through the courtesy of certain manufacturers of such tools we are able to reproduce several jobs which have been successfully completed in manufacturing plants on keyseating machines.

To enumerate all the various types existent would serve no special purpose, and to go into the question of design would be likewise futile. Various makers claim certain features for their particular product, but in all cases the principle is the same, (i.e.) to pass a cutter through the piece, thus cutting a keyway, or special shaped slot. When



special shaped slots are to be cut, it merely means the making of duplicate shaped cutters, which are placed in the standard bar, or if the work is of very intricate shape, a special bar may be used. In any case it does not interfere with the production of the machine itself.

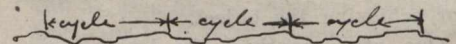
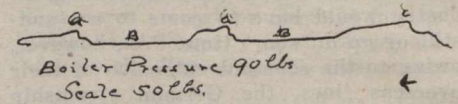
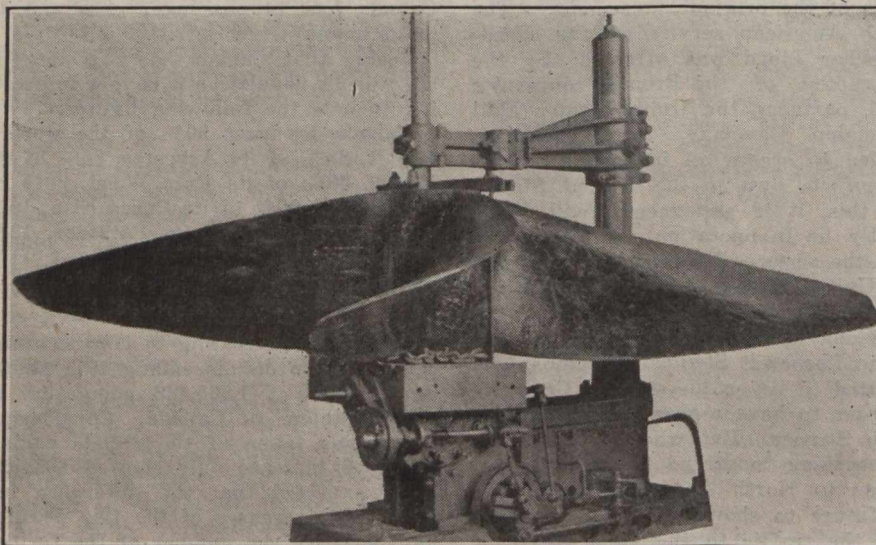
As a general rule, the modern keyseater is equipped with some type of feed which relieves the cutter on the backward stroke, and which may be set to cut the keyway to any desired depth. Once having been set, the machine is started and will cut any number of keyways alike without further adjustment. Where the keyway is very small, or where there are only one or two pieces completed at a time, the hand method of feeding is usually found to be quite sufficient.

## STEAM PRESSURE BOILER FEED PUMPS

By R. McLAREN

"In boiler-feed pumps the steam pressure available and the pressure pumped against are practically equal, so that it might be expected that the area of the steam piston would be made about 40 per cent. larger than the area of the water piston. In actual practice it is found, however, that pump manufacturers prefer to make the steam piston about three times the area of the water piston in very small pumps and about twice the area of the water piston in large pumps. The steam piston of boiler-feed pumps is made so largely in excess of what it really needs to be merely as a matter of safety; its large size simply tends to insure a prompt starting of the pump under almost all con-

\*Photographs through courtesy of Baker Bros., Toledo, Ohio, and Morton Mfg. Co., Muskegon Heights, Mich.



atmospheric pressure

Indicator diagram from pump steam chest. conditions likely to arise in practice."

With the above in mind I was curious to know what pressure there would be in the steam chest and therefore throughout the entire stroke of a duplex, direct acting, outside packed plunger pump whose steam piston is 7½ inch in diameter, water plunger 4½ inch in diameter and stroke 10 inch.

The pump is controlled by a pump governor of a type designed to maintain a constant pressure in the feed line. An indicator was attached to the steam chest cover and by drawing the cord out slowly and steadily while pressing the pencil to the paper, a chart was obtained showing the pressure in the chest over a period covering several cycles. A 50 lb. spring was used and it will be seen that at no point was the pressure up to 50 lbs. in the chest although it was close to it. Fig. 1 is the chart. The boiler pressure was 90 lbs.

and the pressure in the feed line 110 lbs.

With the throttle closed so that the pump would move very slowly, Fig 2 was obtained.

The governor was not by-passed, the steam having to pass through the governor and the partly closed throttle. At the points a a a the speed accelerated. At points B B the pump was apparently stuck. Can anyone explain why the pressure did not rise at points B when the pump was not moving?

**HOME MADE FORCE HAND OR POWER OIL PUMPS**

By JAMES E. NOBLE

A friend wanted a one quart size oil pump and upon inquiry he discovered the price to be from \$9.00 upwards. The man who paid him his salary refused to invest this amount so the friend collected some pipe fittings and put them together in the shape shown in the sketch. I will not give any dimensions as the pump can be made any size with a 1/4 inch plunger upwards. A

As shown it is hand operated but the tee can be removed and a proper attachment used if it is desired to operate it by power. The reservoir can be set up on a shelf if the user would rather have it there, if the conditions are such that the oil will not flow out of the reservoir by gravity when the oiled machines are not operating.

Oil can be prevented from running from the reservoirs by gravity by adding a cut off valve between check valve G and the elbow, or a spring loaded valve can be used instead of check valve F. It is not difficult to make such a

only 1-6 under crop. Canada has 1,000,000 choice farms awaiting settlers. Canada has only 2 coal regions on the seacoast in North America and controls 1-5 of the world's coal resources. Canada's farming industry has increased twelve-fold in thirty years from \$14,000,000 to \$173,000,000. Canada's forests are estimated to contain eight hundred billion feet of commercial timber and one million cords of pulp wood. Canada has most expensive fishing grounds—5000 miles on the Atlantic, 7,000 miles on the Pacific and 220,000 square miles fresh water. Canada has over 38,000 miles of railway, or one mile for every 224 persons. Canada has water power equal to 22,000,000 horse power; 90% is still running to waste. There are 686 foundries now in operation. These figures take in Iron, Steel, Brass and Aluminum foundries.

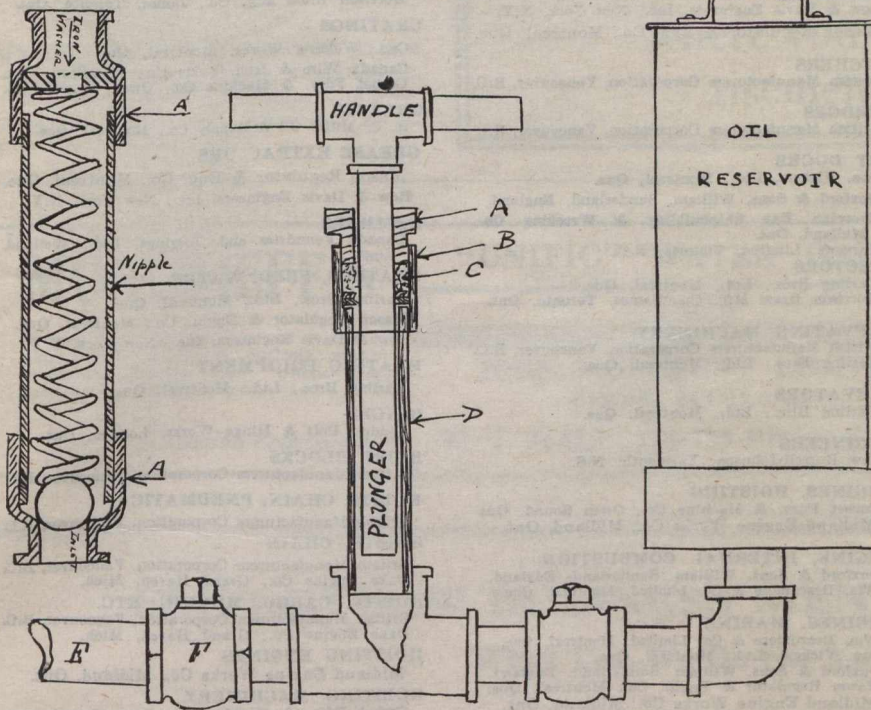
The total number of company incorporations with Dominion charters in 1920 was 991 with a total capitalization of \$603,210,850, the greater part of which, without doubt, represents foreign capital. Just how investment in Canada is increasing can be realized from a comparison with the previous year's figures, when there was a total of 512 companies which received Federal charters capitalized at \$214,326,000. In addition to the figures above recorded 88 companies, by supplementary letters patent increased their capital stock by \$85,187,750. In considering these figures, too, it should be borne in mind that no account is taken of the host of companies incorporated under the charters of the various provinces, all of which have power to grant charters.

**OBITUARY**

The Port Warden of Montreal, Captain James Nunn Bales, died in that city on January 26th last, in his sixty-eighth year. The deceased gentleman, who had spent thirty years of his life at sea, was appointed deputy port warden of Montreal in 1900, and on the death of Captain Reid was appointed Port Warden.

He was born in Liverpool, and sailed out of that port for a good many years, serving his apprenticeship in sail, and later going into steam. He was a resident of Montreal for twenty-two years. He is survived by his widow and two sons, and two young daughters. Captain Bales was an elder of Erskine Presbyterian church, a member of the Royal Victoria Lodge, A. F. & A. M. and a member of the Montreal Board of Trade. He was also a curler, being a member of the St. Lawrence Club.

Mr. George McKenzie, who was from 1873 to 1903 engaged as purser on the steamboats owned by the Folgers of Kingston, died in that city on Feb. 2 last. He retired in 1903 and has been living privately ever since. Mr. McKenzie came to Canada with his parents in 1846, and from 1860 to 1873 conducted the Anglo-American Hotel on Ontario Street, Kingston. He is survived by his widow and one daughter.



General arrangement of pump. Detail of spring and ball valve at side.

is a bushing, B is a coupling, C is packing, under the packing are shown two iron or other metal washers, they prevent the packing working down into the cylinder D, which is a piece of plain iron pipe, it does not require a finished inner surface as the plunger is a very loose fit, the iron rod plunger should be made as smooth and true as possible on account of the tight joint necessary at the packing.

F and G are check valves. E is the discharge. The oil reservoir can be tin or galvanized sheet iron. The sketch shows a piece of large pipe with a bottom cap tapped to take the nipple, an ordinary tin cover on the tap.

valve. Fig. 2 will give an idea for a home made one. A being reducing couplings, B, an iron or brass washer to hold the end of the spring, C the closing valve, consisting of a round ball, a nipple is between the couplings, a long thread being on the ball end. The inlet of course is at the ball end.

The following information has been secured from the Bureau of Canadian information which is connected with the Canadian Pacific Railway Company. These figures will prove very interesting to those who are not aware of the many points of advantage in Canada. Canada has 300,000,000 acres agricultural land,

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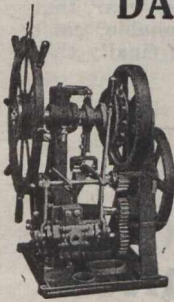
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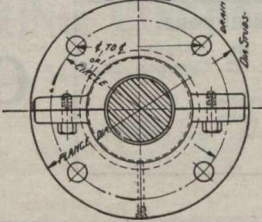
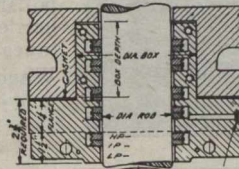


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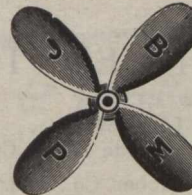
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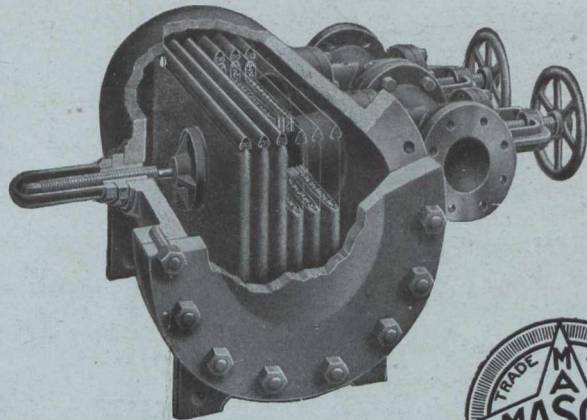
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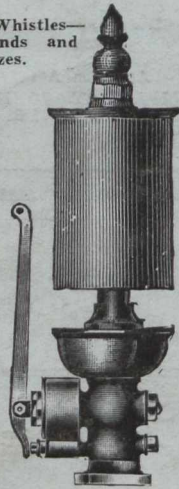
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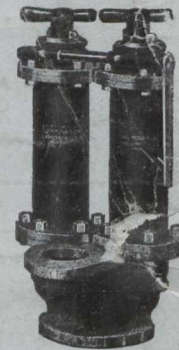
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