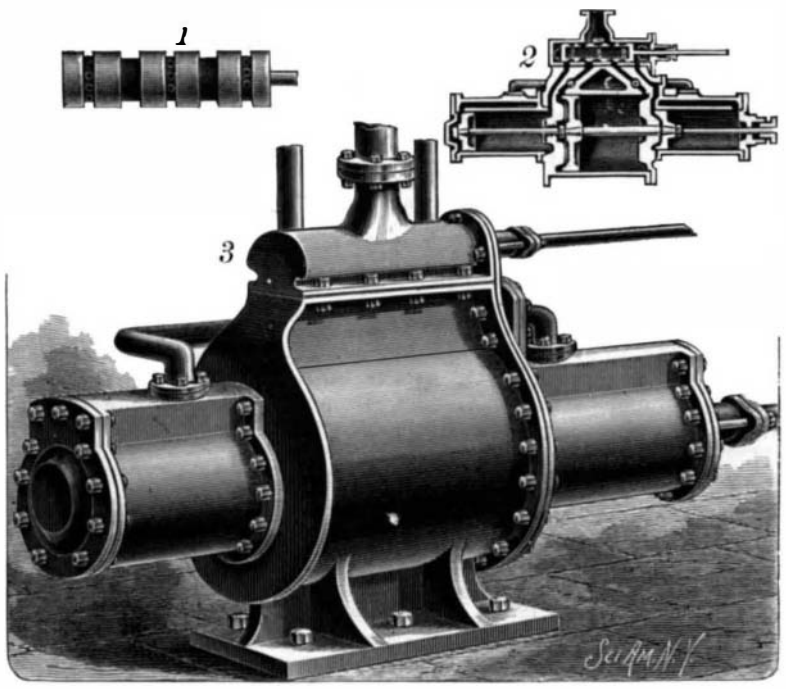
AN IMPROVED COMPOUND ENGINE.

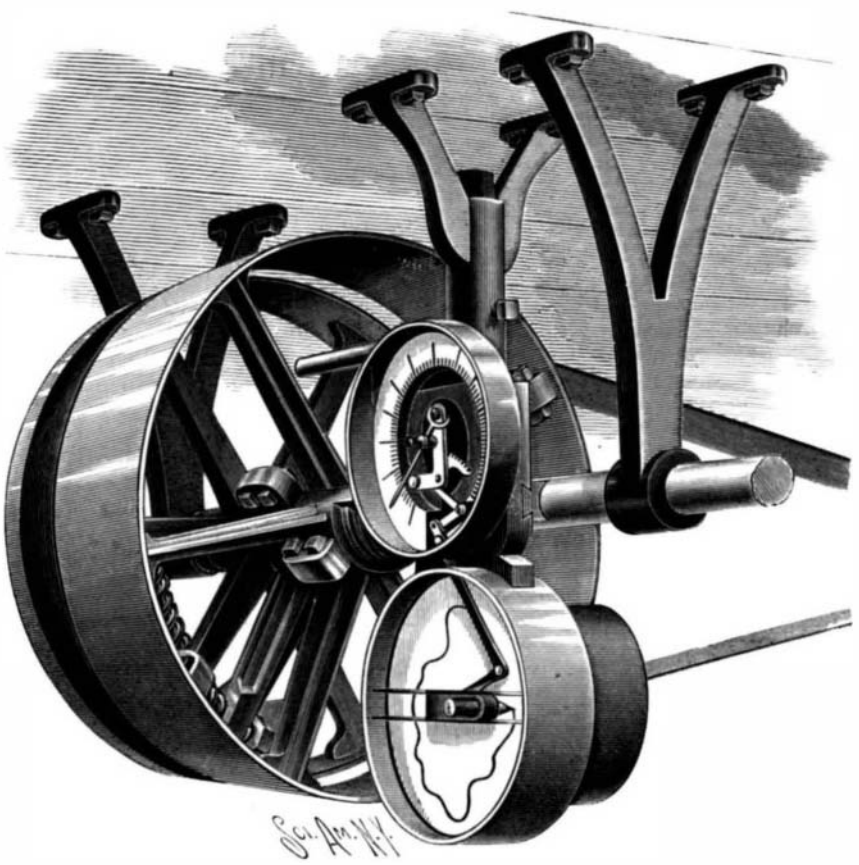
The engine herewith illustrated has been patented by Mr. John Riekie, of Saharanpur, India. It has two high pressure cylinders, and between them a low pressure cylinder, all in line with each other, and their pistons secured to a common piston rod connected in the usual way with the driving shaft. Into the inner ends of the high pressure cylinders as shown in Fig. 2, lead live steam ports opening into the ends of the steam chest, which is preferably of cylindrical form, and contains a hollow cylindrical valve, shown in Fig. 1, connected with a valve rod operated in the usual manner from the main shaft. Into the ends of the steam chest lead pipes connected with the boiler, and from the top of the steam chest in the middle extends the exhaust pipe, channels therefrom leading to the interior. The steam chest is also connected near its middle by ports with the ends of the low pressure cylinder, and from these ports lead pipes connected with ports leading to the outer ends of the high pressure cylinders. In the periphery of the cylindrical valve are annular grooves connected with the interior of the valve, and grooves adapted to register with the ports connected with the ends of the low pressure cylinder and with branches of the exhaust pipe. With this construction the boiler pressure of the steam does duty for one stroke in the high pressure cylinder, after which this cylinder is converted into a steam chamber on the return stroke of the piston while the steam is doing a second duty, expanding in another cylinder. In this way equal power is exerted on the crank arms at all stages of expansion, compounding being done on each crank separately.



RIEKIE'S COMPOUND ENGINE.

AN IMPROVED DYNAMOMETER.

A power indicator and recorder designed to accurately measure or weigh the power necessary to operate a machine or a number of machines driven from the same shaft, and automatically record the amount, is shown in the accompanying illustration, and has been patented by Mr. Emery Nixon, of Toronto, Ontario, Canada. The driving pulley is mounted to turn loosely on the driving shaft, and is turned by a pin engaging one of its spokes, the pin being secured near the outer end of one arm of a two-part bar made to loosely clamp the hub of a wheel secured on the driving shaft. The end of the other arm of the bar is held to slide on a segmental guide bar secured in lugs on the inside rim of the wheel, there being on this guide bar a coiled spring, one end of which presses against the arm and the other against the lug farthest from it. In the hub of the two-part bar is a spiral groove, into which fits a pin secured on a dovetailed bar fitted to slide in a groove in the hub of the wheel, the bar extending parallel with the driving shaft, and having on its outer end a lug engaging an annular groove in a ring held concentric with the shaft, and provided with a bar which operates the indicator, suitably mounted in proximity thereto. The bar operating the indicator is pivotally connected by a link with a segmental gear wheel in the indicator casing, this gear wheel operating a pointer which travels over a dial. The indicator-operating bar is also pivotally connected by a link with one end of a lever operating the registering device, provided with a pencil adapted to mark on a graduated card. With this construction all the power used to run the driving pulley is communicated through the dynamometer, one arm of the two-part bar pressing against the spring on the inside of the rim of the wheel fixed on the driving shaft, with a force proportionate to the amount of power used, and, by means of the connections through the spiral groove of the hub with the indicator and recorder, the load carried by the driving shaft is regularly measured and recorded.



NIXON'S POWER INDICATOR AND RECORDER.

For further information relative to this invention address Mr. Spencer Love, No. 10½ Adelaide Street East, Toronto, Ontario, Canada.

WINDOW plants may be grown any season of the year in the following manner: Soak a large piece of coarse sponge in water, squeeze half dry, and sprinkle in the openings red clover seed, millet, barley, grass, rice, and oats. Hang it in the window where the sun shines a portion of the day, and sprinkle daily with water. It will soon form a mass of living green where even the clover will bloom.

Difficulties Encountered in Statistical Work.

Francis A. Walker, President of the Massachusetts Technological Institute, on the study of statistics in colleges and technical schools, says:

Those who have never tried their hand at statistical work will fail to appreciate the difficulties to be encountered at the start, and the frequently recurring need of going back and beginning all over again. To go to a series of extended tables with multitudinous subdivisions, in which a given total is distributed among many classes, and to take therefrom just what you want, no more, no less, and no other, to make sure that your parts when put together will form a whole, and that no direction conveyed by the heading of a single column has been neglected, is a task for which men must be trained, and in which they must be practiced, going from simple and easy examples to complex and difficult ones, by patient steps. The great majority of editors and writers for the press, the great majority of legislators and public speakers, either fail on such work, or, as is most likely, judiciously avoid the attempt, even though statistical matter altogether relevant to the subject, and which might be made most interesting to their readers or hearers, lies on every side of them. The learned president illustrates the power a real master of statistics wields over his hearers as follows: Attend a meeting where Mr. David Wells is speaking, and see how he holds the crowded audience in close attention for two hours, with no help from rhetoric, elocution, or gesticulation, merely by the strong, vivid, effective way in which he marshals figures. In my long experience in office at Washington, nothing struck me more forcibly than the helplessness of congressmen—even, with few exceptions, the acutest and best trained—to get up the figures for their own speeches. No matter how clear their conception of the positions they wished to present, few of them could readily and confidently resort to the government publications at hand for the statistical materials with which to illustrate and enforce their views; and the gratitude with which they would accept and acknowledge some trifling assistance from a well trained clerk was almost ludicrous. I do not intend any disparagement by this statement. Statistics have a language of their own, and he who would use them must first learn that language; and this is as yet taught scarcely anywhere.

The Naval Fight of the Future.

Each vessel will clear for action as soon as the other is discerned—perhaps five miles away. Each will probably slow down at first, in order to gain time for preparation, and especially for getting the steam pressure up to the highest point. Forced draught will at once be started, and the subdued roar of the air driven through the furnaces, to accelerate combustion, and the whirr of the dynamos, will be added to the clang of the gun breech blocks, as they are swung open to admit the projectile to the breech, the hum of the ammunition hoists raising powder and shell to the decks, and the quiet, firm orders of authority. On deck the Gatling guns and revolving cannon, and the rapid-fire guns in the tops, are got noiselessly into readiness, the captain takes his place in the armored conning tower with the chief quartermaster and his aid, the executive officer assumes charge of the battery, and remains near at hand to take the captain's place in case of his death or disability, the range finders are got into position, and the officer in charge begins to report from time to time the distance of the enemy, now drawing closer.

Probably not a shot will be fired until this distance is reduced to 2,000 yards, and probably both ships will keep pointed toward each other until that time. But now what will the contestants do? It has been held that both will advance steadily toward each other—each commander hoping that some false move on the part of his adversary will enable him to rush forward, discharge his bow torpedo at 500 yards, and perhaps follow it up with his ram and end the fight at once—until they have approached so close, say 500 yards, that neither dares to swerve lest he himself be rammed, so that the ships will at length collide end on, and may be both sink!

The various inventions of the past few years, rapid-fire guns, high explosives, torpedoes, submarine boats, dynamite guns, and range finders, the increased power and perfection of steam and electric machinery, the improvements in powder and in steel for projectiles and for armor, have not revolutionized naval science so much as they have broadened it. The principles of strategy remain the same, and so does the necessity for the seaman's skill. Engineers construct, inventors invent, experiments are tried, sham battles are fought, and heated discussions agitate the naval mind, but the only thing that can determine the real conditions of modern naval warfare is a modern naval war.—*Lieut. Bradley A. Fiske in the Forum.*

Gunboats for Interior Africa.

The British government has recently intrusted Messrs. Yarrow & Co., of Poplar, with the construction of two steel shallow draught steamers to serve as gunboats, of special design, for the navigation of the Zambesi and Shire. These boats merit attention, owing to the novelty of their construction. They are of the stern-wheel type, 90 feet in length by 16 feet beam, and having a draught of from 18 inches to 2 feet, and are of about the same tonnage as the passenger steamers plying between London Bridge and Chelsea. They will be shipped in pieces and put together at their destination. The most remarkable feature of Messrs. Yarrow's contract is that they have undertaken to put them together at the mouth of the river and have them ready for steaming within 24 hours after arrival without going ashore or having any recourse to the land on either side of the river. At the same works there are being built, side by side with the English boats, six boats for the Portuguese government, for service in the same district. These were contracted for immediately after the recent expedition up the Zambesi in three steamers, also built by Messrs. Yarrow, of which Major Serpa Pinto was in command. The Portuguese will, therefore, before long, have a small fleet, consisting of nine gunboats, on the Zambesi.