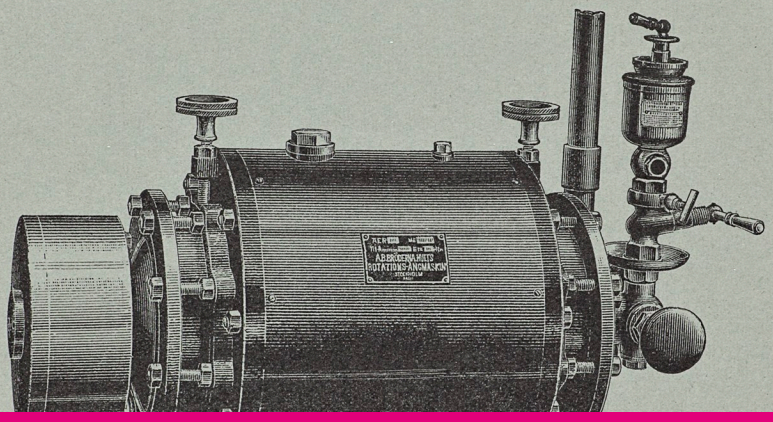
HULT BROTHERS'

Rotary Steam-engine



AKTIEBOLAGET

BRÖDERNA HULTS ROTATIONSÅNGMASKIN

STOCKHOLM

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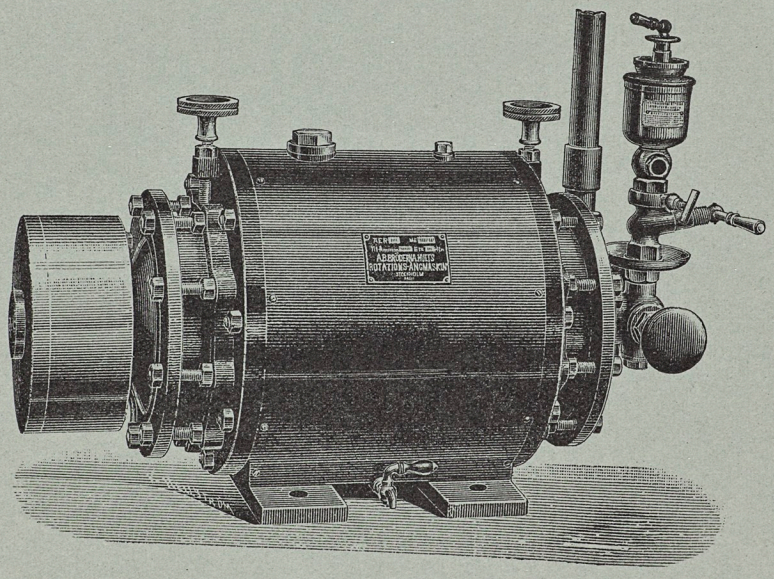
Rotary Steam-engine



AKTIEBOLAGET

BRÖDERNA HULTS ROTATIONSÅNGMASKIN

STOCKHOLM

HULT BROTHERS'

ROTARY STEAM-ENGINE.

By giving to a motor a direct rotary movement many of the disadvantages incident to a reciprocating engine are avoided. Among other advantages the very essential one is gained that the working parts of the engine do not change their direction of motion. The running of the engine consequently becomes smoother and it is possible without unduly straining the engine, to raise its speed considerably higher than in an engine of the ordinary type. The numerous attempts made from time to time to construct rotary engines furnish ample proof of the fact that these as well as other advantages of this class of motors have been long understood. These attempts, however, have all failed owing to the difficulty of overcoming certain draw-backs, as excessive friction and a resulting small efficiency, lack of durability, and excessive steam-consumption. In the Hult Brothers' Rotary steam-engine these disadvantages are overcome along with others, partly in consequence of the fact that the cylinder surrounding the piston is caused by the friction to take part in the rotation of said piston, by which construction the great amount of friction usually developed at their point of contact is practically annihilated, and partly because the shafts of the rotating parts are journalled upon flexible rollers or rings, the journal-friction of the engine accordingly being likewise reduced to a minimum.

Plates 1 and 2 annexed show the principal parts of such an engine. As seen by the drawing, the steam flows through the throttle-valve at the right hand side of the engine into the distribution-sleeve which is inserted in the hollow engine-shaft and can be so adjusted that the aperture made in it is for a longer or shorter portion of one revolution in communication with the straight admission-ports of the cylindrical piston or

roll, whereby the duration of admission and the rate of expansion of the steam are determined. By these ports steam is admitted into the working-space between piston and cylinder and here periodically acts on the rear side of the driving-vanes, thus producing the rotation of the engine. The spent steam exhausts from the space in front of the vanes through the curved ports terminating at the end-surfaces of the piston, whence it flows into the space surrounding the steam-cylinder, to be finally discharged through the exhaust-pipe in the base-plate of the engine. In consequence of the friction between the internal rotary parts and their envelope, the cylinder, the latter will take part in the rotation of the piston in such a manner that their circumferential velocities will be equal but for a slight amount of slip between the end-surfaces of the piston or roll and the cylinder-heads, due to the fact that the centres of rotation of the cylinder and the roll do not coincide with each other, a similar insignificant slipping-action likewise taking place between the vanes and the inner circular surface of the cylinder. Owing to this slight difference in velocity of the contacting surfaces mentioned, the points of contact of said surfaces will change continually and uneven wear of the engine consequently be prevented.

The shaft of the piston or roll as well as the gudgeons of the cylinder are journalled in roller-bearings (Figs. 3 and 4), of which those two belonging to the piston-shaft are located outside the end-walls of the engine-frame or casing while the two for the gudgeons of the steam-cylinder are situated inside of said walls (Fig. 2). The rollers of these bearings are composed of steel-rings made so as to yield or spring slightly, whereby the tension radially, required for effecting a tight fit between piston and cylinder, is produced. Another important advantage of these flexible roller-bearings consists in their smooth running, great durability, and remarkably easy motion. Furthermore, they require no other lubrication than that furnished by the exhaust steam and the oil accompanying the latter from the cylinder. The engine, therefore, consumes no more oil than that required for the lubrication of the cylinder. This is unquestionably in itself a great advantage, and at the same time the care of the engine is greatly simplified since hot-running and the consequent cutting of journals is impossible in these bearings.

The engine can be readily readjusted, should this prove necessary

Fig. 1

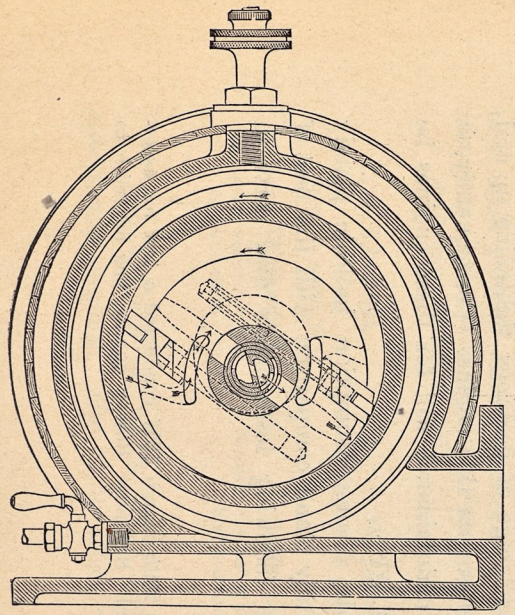


Fig. 2.

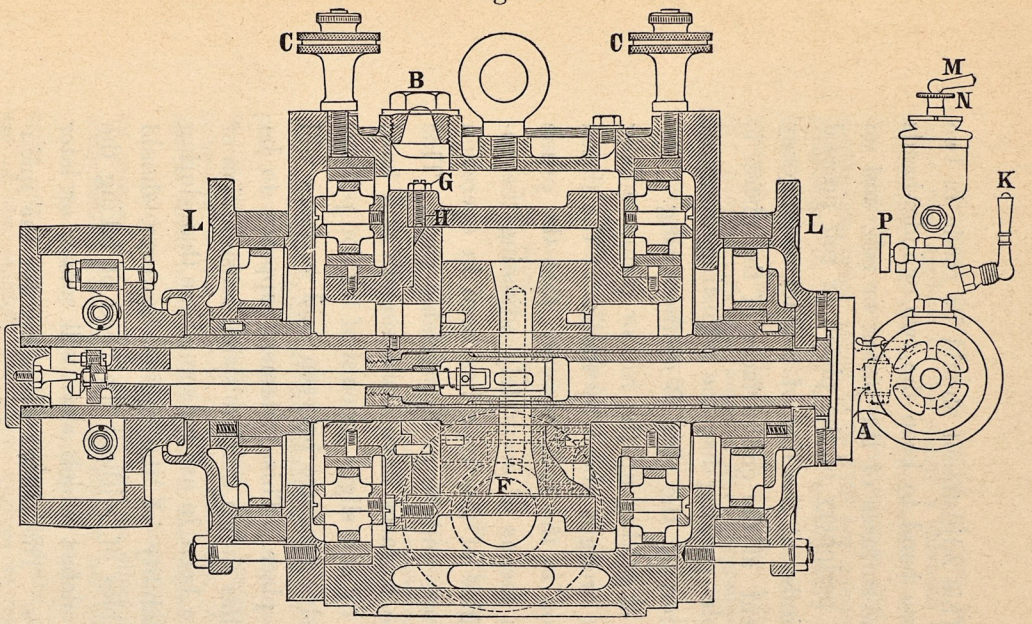


Fig. 3.

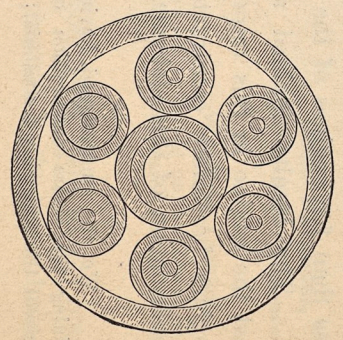
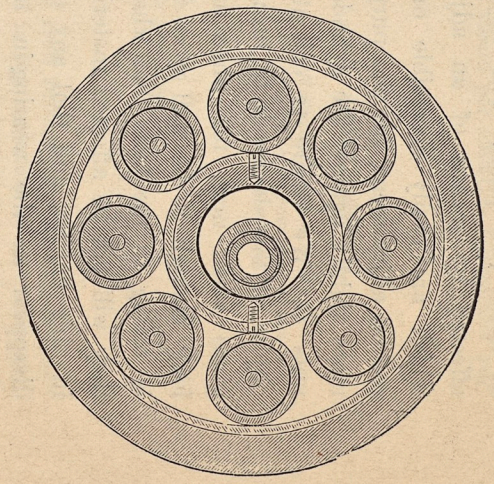


Fig. 4.



after an extended period of use. This adjustment should be made in two directions, its object being on the one hand to keep the two cylinder-heads pressed closely against the two end-surfaces of the piston or roll, and on the other hand to hold the outer periphery of the piston or roll pressed against the inner surface of the cylinder at the line of contact or tangency of these two parts. The adjustment at the end-surfaces of the piston is effected by means of an adjustable packing-disc the adjusting-screws of which are easily accessible on removing the plug B of the casing. The second adjustment, for the purpose of setting up the roll or piston radially more tightly against the cylinder, is brought about by means of the fluted nuts C. We desire to call attention to the fact, however, that the prime object of this device is to furnish a means of accurately adjusting the engines when new, for when an engine of this type has been in operation long enough to be well worn in, there will be no appreciable wear This is owing to the facts that when the surfaces have worn smooth and hard they will not be affected materially by the slight amount of friction present in this engine, and that any excessive pressure between said surfaces will disappear as the wearing-in takes place. This statement appears to be fully borne out by experience which has shown that the steam-consumption of these engines is less when they have been in use for some time than during the first three weeks. The adjustability of the engine, however, should add further to its value since it enables of, without the need of taking the engine apart, easily remedying any defect which wear will sooner or later produce in the very best of engines. The labour necessary for the maintainance of an ordinary engine, as exchange of packings, tightening up and scraping boxes, etc., need not be spent on this engine. Consequently, it may safely be said that the cost of maintainance will for these engines be less than for engines of the ordinary type.

The results attained as regards steam-consumption indicate plainly that the engine in this respect can fully stand comparison with the best of engines heretofore constructed. The following testimonials may serve in confirmation of this statement:

We the undersigned, having on the 20:th March 1897 conducted a test for ascertaining the steam-consumption of the Hult Brothers' Rotary engine, beg herewith to present the following testimonial:

The test occupied a period of two hours and two minutes, during which time there was applied to the engine a balanced friction-brake, loaded with a weight of 7,2 kilogrammes at the end of a horizontal lever 385 millimetres in length. The speed of the engine was noted every five minutes during the whole test, the average number of revolutions being found to be 1128 per minute, and the effect developed by the engine accordingly to be 4,3658 effective horsepower. The steam-consumption, which was ascertained by weighing the feed-water, taking into account the water-level in the boiler, amounted to 196,63 kilogrammes for the total time of the test, which corresponds to 96,7 kilogrammes per hour or 22,15 kilogrammes of steam per effektive horsepower per hour.

Stockholm March 22, 1897.

E. A. Tidblad.

Engineer in Chief at the
J. & C. G. Bolinder's Mekaniska Verkstads
Aktiebolag, Stockholm.

And. Lindström.

Mechanical engineer at the
J. & C. G. Bolinder's Mekaniska Verkstads
Aktiebolag Stockholm.

F. Flodman.

Engineer in Chief at the
W. Lindberg's Verkstads och Varfs Aktiebolag,
Stockholm.

At the request of the managing director of the Hult Brothers Rotary Engine Company, we, the undersigned, have this day convened in the workshop of said Company at Carlsvik and conducted a test of a rotary engine set up at said place and executed according to the patents of the Company, which engine was driven by steam from a special small boiler located close to the engine. The results of the tests were as follows:

During a continuous test of 2 hours, while the loading of the engine vas effected by means of a strap-brake, its average effect was 7,62 brake-horsepower and its average water-consumption per brake-horsepower per hour 22,7 kilogrammes.

The speed, which according to the revolution-counter was on an average 1296 turns per minute, was very uniform and the running smooth, and for these reasons we are of the opinion that these engines as regards both economy and running qualities fully equal previous existing motors with which a comparison may be drawn, besides possessing all the advantages of a rotary engine.

Stockholm, March 18, 1898.

C. A. Lindvall,
late Chief of the
Bergsund works.

W. Jacobsen,
Chief of the Bergsunds works.

Oscar Nycander,
Consulting mechanical engineer.

Thore Thelander,
Designing engineer at the
Bergsund works.

John Luth.
Managing director of the Luth & Rosén
Electrical Company.

Wahlfrid Larsson,
Chief of the workshops of the
Luth & Rosén Electrical Company.

The engines on which these tests were conducted were simple non-condensing engines. The mean effective steam-pressure in the boiler during

the respective tests was 5,5 and 6,6 atmospheres, and the engines worked with a cut-off of respectively 0,4 and 0,5.

Among the advantages of motors of this type the following may be noted:

Their dimensions are very small in comparison with previous constructions.

It is evident from the general arangement of the engine that its durability is very great. It is not sensitive to shocks or rocking movements, a fact which together with the small space occupied makes it specially adapted for use on railways and vessels, for instance. It may to the same advantage be coupled directly to a dynamo as to the shaft of a screw-propeller. Arranged as a marine-engine it is very easily operated since the reversing-gear of this engine is simpler than that of engines of the ordinary type. The slight space occupied by the engine should, moreover, be of the greatest importance in a marine-engine.

As the working-parts do not change their direction of motion, the engine runs smoothly and without shocks, even without the use of a heavy fly-wheel.

The journal-bearings of the engine do not require any more oil than that supplied by the exhaust-steam, and for this reason the lubrication of said bearings is effected by the oil used for lubricating the cylinder.

Price and Specifications.

The engines are manufactured in Standard patterns according to the following table:

Pattern.	Effective Horsepower	Revol. per min.	Belt-pulley		Price in Kronor.
			Width in millim.	Diam. in millim.	
A	5	1,300	100	222	700
B	10	1,200	122	250	1,000
C	15	1,100	170	300	1,300
D	25	1,050	230	300	1,800
E	30	1,000	275	310	2,100
EF	40	950	360	350	2,650
F	50	900	425	400	3,200
G	75	800	500	450	4,250
			Rope-pulley 10 25-millim. ropes		
H	100	750	360	530	5400

The engines are as a rule furnished to develop the corresponding horse-power and number of revolutions given above. Rotary steam-engines to run at either higher or lower speed as well as to develop greater power are furnished to order.

Directions for setting up and care of engine.

In unpacking the engine, take care that dirt does not enter the steam-pipes, and before screwing on the oil-cup and throttle-valve clean them carefully.

The steam-strainer on being cleaned is inserted between the flange (A) and the throttle-valve.

All steam-pipes from the boiler to the engine should be blown out in order to remove impurities in the line of pipe before the engine is coupled to it. As a suitable packing between the flanges good drawing-paper may be used which has been previously soaked in lin-seed oil and rubbed over with graphite. The inner diameter of the packing must on no account be made less than the diameter of the pipe, and it should be cut out evenly.

In starting, the engine should first be heated for some 5 or 6 minutes by admitting steam from the boiler into the outer casing by opening the small cock on the admission pipe. Next, there should be seen to that the oil-cup handle is placed on »open» or »marche»; »fermé» is the reverse or »closed». As regards the regulation of the oil-cups and lubrication, see the directions below.

On completing the heating just mentioned, steam should slowly be admitted while at the same time it is seen to that the oil-cup discharges oil.

The only thing afterwards to be observed during the running of the engine is to see that the lubrication takes place regularly, and to fill on oil when needed.

It is of importance to use oil of good quality; best kind of »valvolin» may be used to advantage for the lubrication. The oil-cup should furnish 50 or 60 drops a minute, and the best plan is to fill the cup while the engine is not running. The filling may, however, be done when the engine is running; in either case the following rules of filling should be observed:

1) **Close cock K** by turning it to the right by a light pressure on the handle; the word »fermé» engraved on the handle should in this case be at the top.

2) **Unscrew the small top-wheel N** so as to release the valve.

3) **Blow out** by unscrewing the small handle P below, in order to get rid of the excess of pressure in the oil-cup and allow the now released valve to open.

4) **Fill on oil**, the best plan in so doing being to use a vessel either containing just the volume that the oil-cup will hold or provided with graduations enabling of filling on the accurate quantity required.

5) **Close** at the top by screwing up the small wheel N and at the lower end by the small handle P.

6) **Open the cock** by turning handle K to the left by a light pressure; the word »marche» engraved on the handle should now be at the top. The lubrication is controlled by means of the small handle M at the top.

In adjusting the engine, the following should be observed:

The plug B on the casing should first be removed, and when the belt-pulley of the engine be subsequently turned by hand all set-screws H of the cylinder will be accessible. (For use on these screws a combination socket-wrench and screw-driver accompanies the engine.) All the lock-nuts G should first be unscrewed, precaution being taken that the screws H be not disterbud from their position, the latter being done by holding them in place by means of the screw-driver located inside of the socket-wrench. Screws H should subsequently be tightened up, special care being taken that they be all revolved accurately the same amount, whereupon the lock-nuts G are again screwed up. In thus adjusting, the best plan is to revolve the cylinder several times by means of the belt-pulley and in due succession set up each screw but slightly until it is felt that the engine begins to turn somewhat harder, the adjustment being now satisfactory.

The radial adjustment between the cylinder and roll or piston is performed by unscrewing the nuts on the two cast-iron heads L and subsequently screwing up by hand simultaneously the two fluted nuts C, not hard enough, however, to produce any appreciable resistance to their rotation. The nuts on the cast-iron heads L are afterwards set up anew, and the engine will again be in working order.

The engines may advantageously be provided with a condenser. When desired, we furnish all necessary information on this point, regarding choice of system of condensation, etc.

TESTIMONIAL.

Borås, Febr. 13, 1899.

Aktiebolaget Bröderna Hults Rotationsångmaskin, Stockholm.

Having now got running the **10 effective horse-power Rotary Steam-engine** furnished by you, direct coupled to a Wiklund 55 amp. dynamo, we cannot refrain from stating that we are entirely satisfied with it, and more especially we will testify to its even running and, judging from our experience thus far, small steam-consumption, all things which, together with the fact that it requires but little care, make your new type of engine worthy of all consideration.

It is a pleasure to us to furnish you this testimonial.

Yours respectfully

Aktiebolaget Nya Snickerifabriken.
(Harald Friberg.)

Stockholm, Kôersners Boktr.-Aktieb., 1899.