

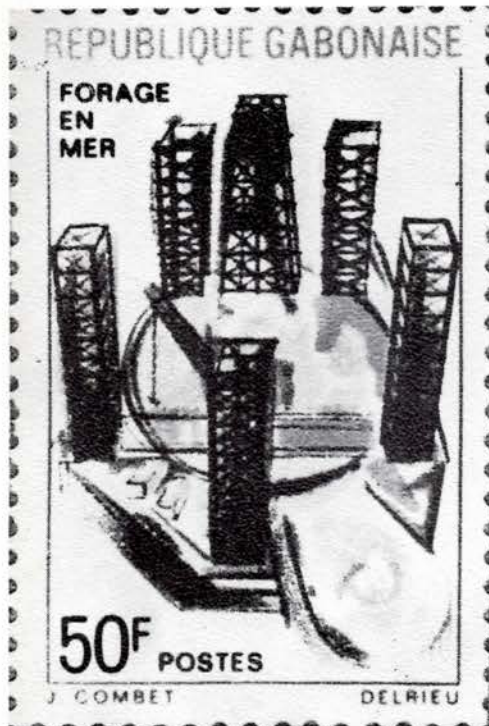


I.H.C. HOLLAND IL

I.H.C. HOLLAND - OFFSHORE DIVISION - P.O. BOX 11 - SCHIEDAM



IN THIS ISSUE



The news that I.H.C. Holland had won an order for the building of an ultra-modern drilling ship received wide coverage in the international press. The description of the vessel given on these pages includes some features not so far reported. It goes without saying that any further information will gladly be furnished on request.

Our considerable experience in the design and construction of heavy duty floating cranes is embodied in a range of fully standardized units introduced recently under the banner "I.H.C. Stancrane". These are fully described in our brochure OPU 17, an extract from which appears here.

Experiments concerned with the laying of underwater pipelines form the subject of an article by a senior engineer of the Group's laboratory.

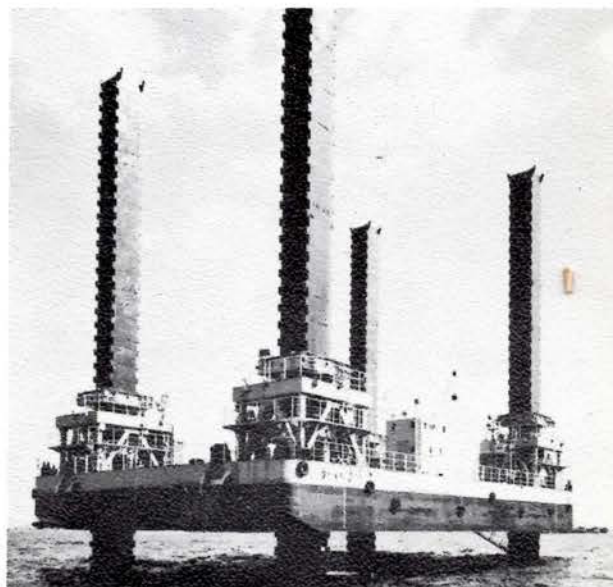
It is a far cry from stamp collecting to oil prospecting, but readers with a philatelic bent will doubtless be interested to learn that, for the second time in the space of a few months, offshore equipment has been chosen as the subject for a new issue. We are naturally proud that the honour has once again fallen to a unit built by our Offshore Division.

The new stamp, from Gabon, bears an artist's impression of the 5-spud jack-up rig *Ile de France*.

SELF-ELEVATING PLATFORM HANDLED OVER IN JAPAN

An agreement signed on 26th June, 1968, gave Kawasaki Heavy Industries of Tokio access to know-how and patents possessed by I.H.C. Holland and provided for the building under licence of self-elevating platforms to our design. The arrangement reflected the very high costs of insurance and towage involved in transporting such units to the Far East.

This agreement has already borne fruit. At a ceremony held in Kobe on 22nd October, 1969, and attended by Mr. H. Smulders, president of I.H.C. Holland, the first platform built under licence by Kawasaki was handed over to its owners, Offshore Equipments Ltd. The *Kaiyo*, as it is named, will be used for a range of purpose including pile-driving and other operations under water, and harbour construction.



Western hemisphere:
Nindustra, 17 Battery Place, New York, N.Y. 10004

Eastern hemisphere:
L. v.d. Veen, 84 Jalan Ampang, Kuala Lumpur,
Malaysia

I.H.C. Holland (Australia) Pty. Ltd.,
37/49 Pitt Street, Sydney N.S.W. 2000.

Self-elevating platform handed over in Japan

The first I.H.C. platform, built under licence in Japan, was handed over by the builders, Kawasaki Heavy Industries, to its new owners.

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I.H.C. Holland wins contract for drilling ship

The most up to date drilling unit in the world will be owned by a French based offshore contractor. I.H.C. Holland's Offshore Division commences design studies in 1967. Read about the outstanding features on

page 4



Pipelaying under water

One of the chief difficulties encountered in laying offshore pipelines is the prevention of movement and consequent damage.

I.H.C. Holland's laboratory — the M.T.I. of Delft — has studied the subject in depth and conducted extensive model tests.

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I.H.C. Stancrane

Standardization as practised by I.H.C. Holland affords three real advantages: it cuts costs, it cuts delivery time, it means ex-stock spares.

Meet both series: the N.B. (normal boom) and the K.B. (kneeling boom) on

page 10



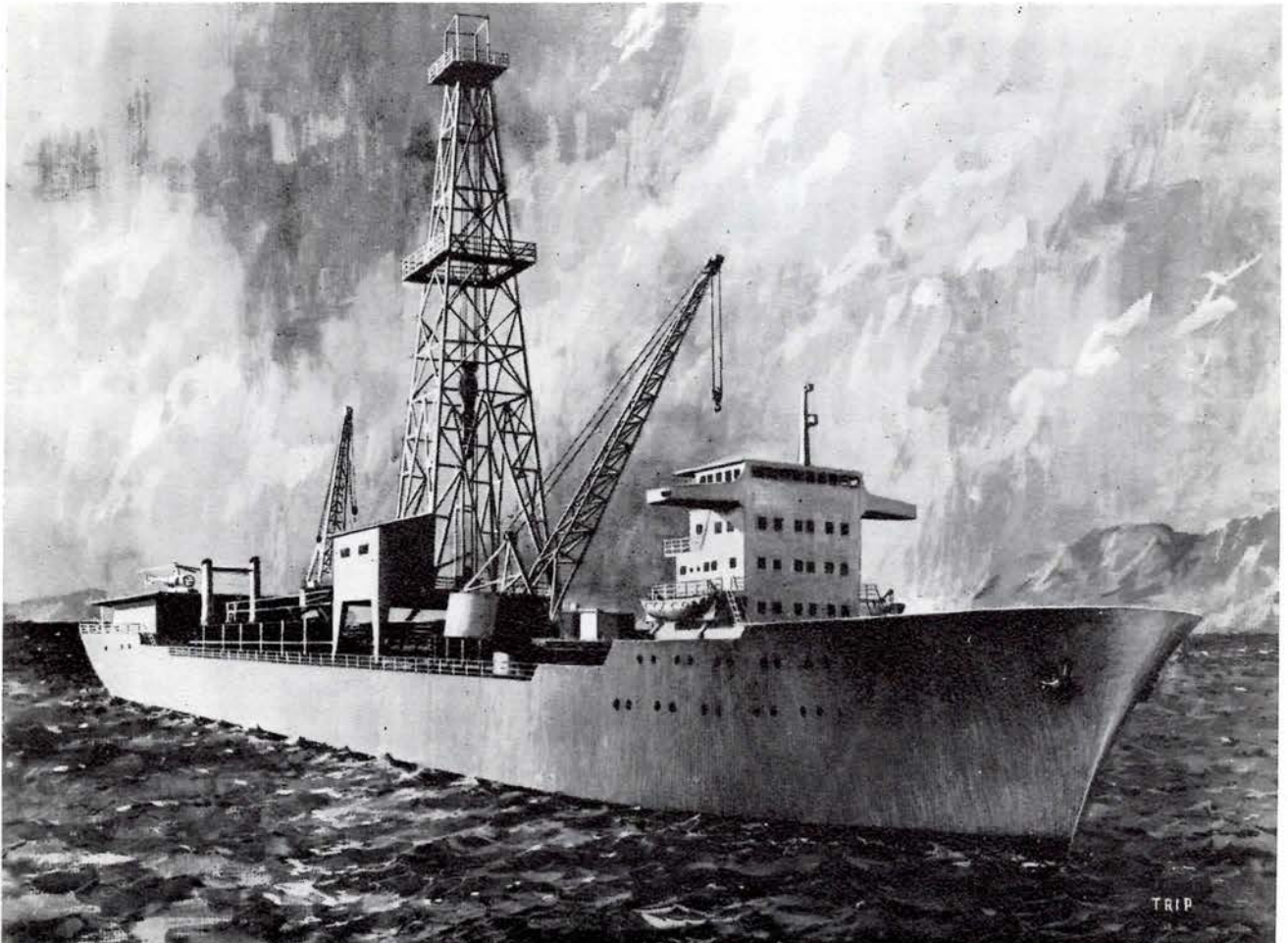
I.H.C. HOLLAND WINS CONTRACT FOR DRILLING SHIP

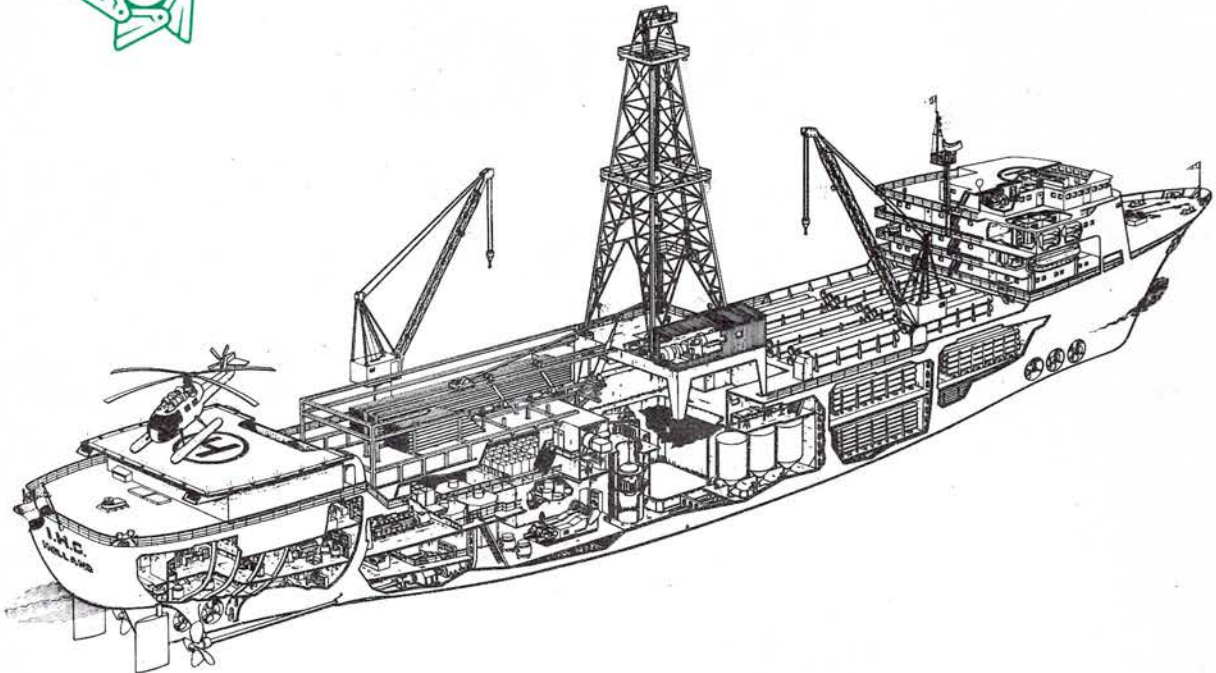
Société Maritime de Service (SOMASER), the French-based offshore contractor, has placed an order with I.H.C. Holland for a diesel-electric drilling ship. The contract, worth more than \$ 11 million, is the first to be awarded to a European yard for a vessel of this type.

The ship will be the most up to date mobile drilling

unit in the world, and will spend the first few years of its life on exploration for C.F.P. (Compagnie Française de Pétrole).

Anticipating the demand for offshore drilling rigs capable of operating in deep water and being shifted more rapidly than current types, our Offshore Division commenced design studies for a drilling ship in 1967.





Far-reaching investigations, backed up by model tests and computer calculations, resulted in a design which in due course proved to correspond in all major respects to SOMASER's requirements.

The principal particulars of this ultra-modern ship are:

length o.a.	145.00 m (475'9")
length b.p.	137.00 m (449'6")
beam	21.35 m (70'0")
draught	(approx.) 7.00 m (23'0")
speed	13 knots
displacement	(approx.) 15,500 tons

She is suitable for operations in water depths up to 300 m (990 feet) and is equipped to drill two 10,000 ft wells or one of 15,000 ft without replenishment.

The outstanding feature of the design is the DP (dynamic positioning) system. In this, the twin controllable-pitch propellers, each of which is driven by a 3,000 hp electric motor, are used in conjunction with five transverse thrusters, three situated in the fore part and two in the after part. During drilling operations, all seven propellers are commanded by a computer which initiates corrective action if the vessel threatens to drift from the predetermined position. The computer programme is such that the ship's head is kept in the most favourable position in relation to tides and currents.

A stabilizing system comprising detuning tanks situat-

ed fore and aft minimizes rolling motions. The tanks can also be used to shift the centre of gravity. A heliport is mounted on one of the after tanks.

Beneath the 42 m (137'10") high derrick is a drilling shaft 7 m (23 ft) in diameter and 8.25 m (27 ft) deep, surrounding by a work floor measuring 22 x 11 metres (72'2" x 36'1") and situated 4 m (13 ft) below main deck level. A second shaft leading from this floor houses a diving bell which allows underwater operations to be continued in poor weather. On leaving the bell, divers pass through an air lock and thence to the decompression chamber. This chamber is also accessible from the work floor via a watertight door. The drawworks are powered by nine explosionproof 600-volt DC motors each with a rated output of 800 horsepower. The drill strings are taken from the racks and returned automatically. Fore and aft of the derrick are slewing cranes with a hoisting capacity of 40 tons at 10 m (33 ft) radius, a maximum radius of 25 m (82 ft), a hoisting speed with a 40-ton load of 6 minutes and a slewing speed (full revolution) of about 4 minutes.

The vessel has been designed to stay at sea for lengthy periods. Living quarters are provided for a crew of 80 and are situated fore'ard. Delivery is scheduled for the second half of 1971.

With this order, I.H.C. Holland, already a familiar name where jack-up rigs, drilling platforms and heavy duty floating cranes (including the world's largest) are used, has reaffirmed its position as a leader in the offshore equipment field..

PIPELAYING UNDER WATER

EMBEDDING PIPELINES IN A SANDY BED BY MEANS OF WATER JETS

There exist various methods of embedding pipelines in the sandy bed of lakes, rivers and canals, and offshore. The most common method is to dredge a trench into which the pipe is lowered, but this is a costly operation, particularly in deep water.

There is thus a need for simple and preferably inexpensive methods of carrying out such operations. It is widely realized that water jets are a suitable means for trenching in sandy beds, and indeed this method has been employed successfully for the burying of pipelines at several places.

The principal aims of the studies and model tests carried out by the M.T.I. were:

1. to arrive at the optimum method of embedding a pipeline in a sandy bed with the aid of water jets
2. to determine the optimum physical and technical characteristics of a jet trenching unit
3. to study the interaction between unit, pipeline and soil in order to arrive at an optimum operating procedure for existing equipment of this nature.

Factors of importance to the operation

Where an underwater jet is used, it is greatly influenced by the surrounding mass of water. The influence manifests itself in resistance to the force of the expelled water and pronounced deflection of

I.H.C. Holland has undertaken a great deal of research into the problems associated with underwater pelaying. Among the specific subjects studied are the use of a stinger, the constant pipe tension system, anchoring or dynamic positioning of pipelaying barges, and welding methods.

One of the chief difficulties encountered in laying offshore pipelines is the prevention of movement and consequent damage. Of the methods of anchorage employed, trenching is among the surest and also affords the greatest protection. The Mineral Technological Institute, M.T.I. in Delft, I.H.C. Holland's own laboratory, has studied the subject in depth and conducted extensive model tests. Mr. W. J. van Heijst, M.Sc., who headed the project, sums up the findings in the accompanying article.

the jet stream, with the result that the distance over which the jet is effective is considerably less than would be the case in air. In determining the physical features of a trenching unit of this type and the method of operation, it is thus important to keep the nozzles as close as possible to the bed.

The rapid silting of a trench or pit dredged in the seabed is also a major problem. The aim is always to achieve minimum width and maximum depth in order to minimize the quantity of spoil and the duration

Fig. 1

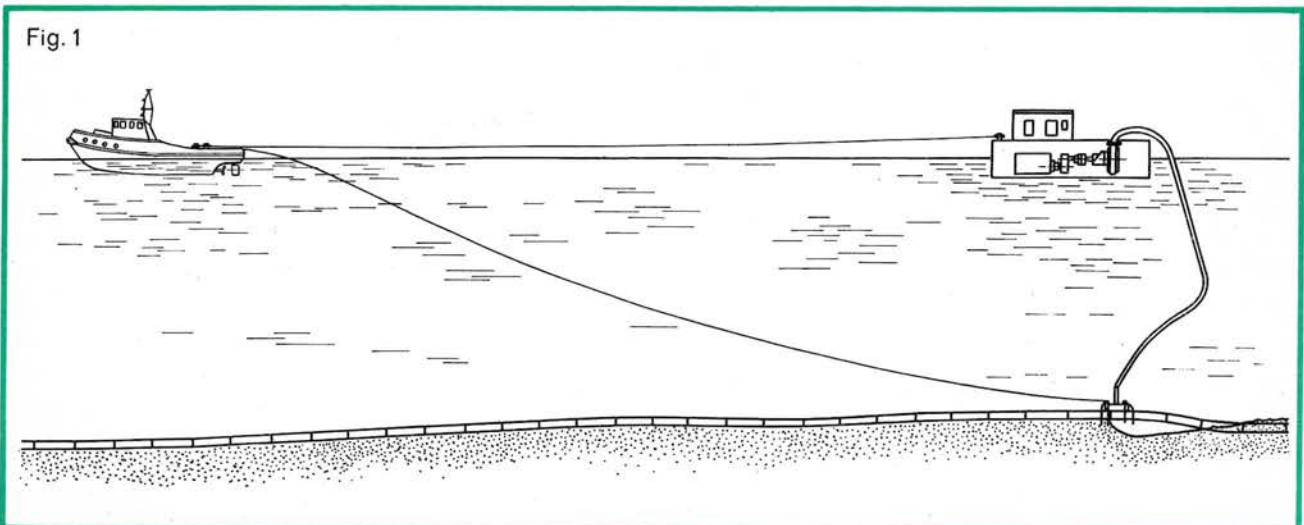
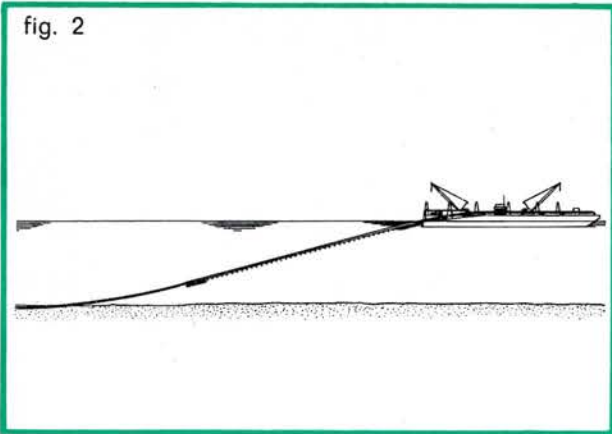


fig. 2



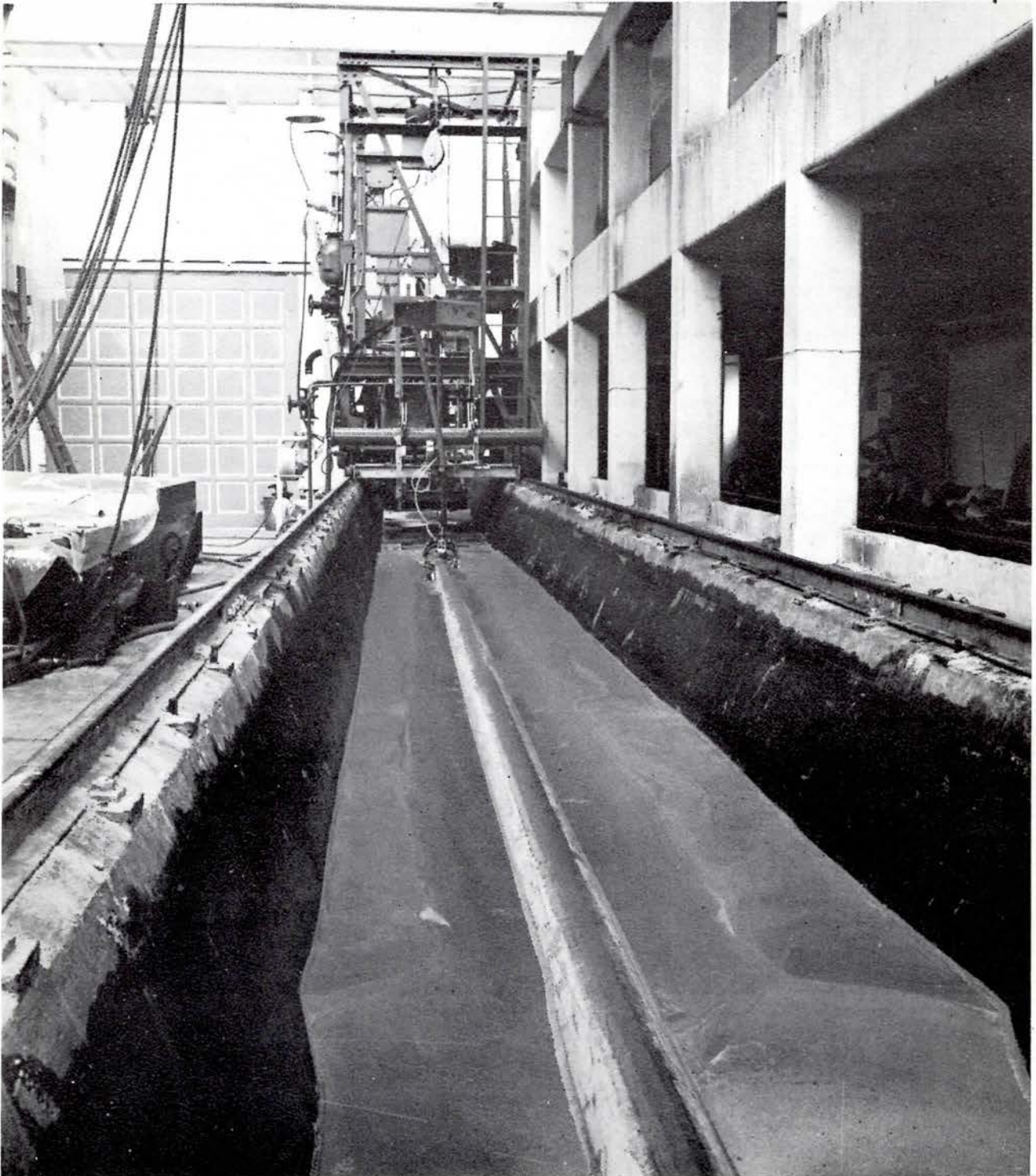
of the operation. This implies a maximum slope angle. However, a steep slope is unstable and readily collapses, thus reducing the effective depth of the trench. The solution lies in embedding the pipeline as quickly as possible after dredging.

Choice of operating method

There are two methods of embedding a pipeline with the aid of water jets, viz.

1. the trench is dredged, after which the pipe is introduced.
2. the pipe is laid on the bed and the trench is cut beneath it, after which it is allowed to sink into position.

Fig. 3



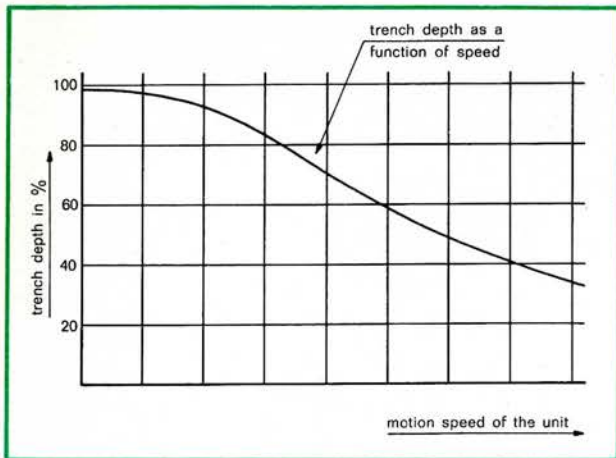


Fig. 4

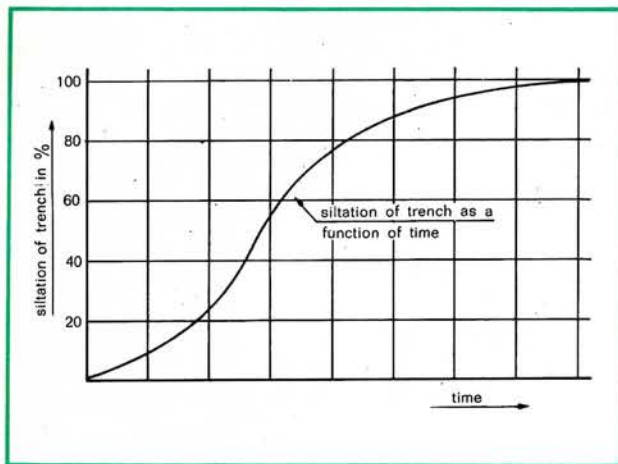


Fig. 5

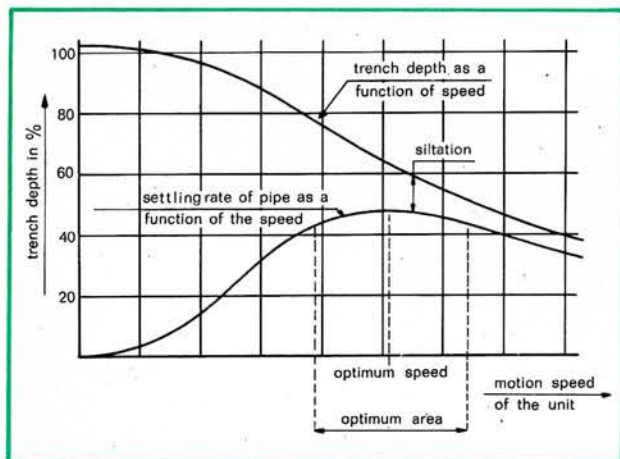


Fig. 6

The first of these is not satisfactory, since it involves considerable delay between the phases, giving time for the trench to become silted. It thus demands an unnecessarily large trench with gently sloping sides. The principal advantage of the second method is that the positioning of the trenching unit can be determined simply: the unit can be designed to move along the pipe, which thus acts as a guide. Moreover, the time lapse between trenching and settling of the pipe is minimal, thus giving little or no opportunity for silting to occur. Last but not least, this method permits dredging of a local nature to be carried out subsequently.

In view of its clear advantages, the second method was chosen as a basis for the study and tests carried out in our laboratory.

The trenching unit concerned consists of a saddle-like frame equipped with guide rollers and a stabilizing tank, and carrying the jet nozzles and associated equipment. A tug is employed to tow the unit along the pipeline. The water for the jets can be drawn from a barge towed by the same tug. Fig. 1 and 2 show the general arrangement.

Details of the jet dimensions are given in an article entitled "Great depth dredger" by Jin Matsuda, to which the reader is referred. In this, the author describes a series of tests which served to determine the relationship between the depth of a jetted cavity and certain values which govern the characteristics of the jet. The article shows that, for a given type of sand, the depth A of a cavity depends upon the water pressure H and the flowrate Q .

The formula is

$$A^3 = C_1 \cdot Q \cdot \sqrt{H} + C_2$$

where C_1 and C_2 are constants. C_1 is determined by, among other things, the grain size of the sand, while C_2 is determined principally by the distance between the jet nozzle and the undisturbed surface of the bed. Observing that the power delivered to the jet is equal to

$$N = Q \cdot H$$

it is shown that, for a given jet power, a high flowrate at a low pressure produces a deeper cavity than a low flowrate at a high pressure.

This is confirmed by our tests on jets fitted to drag heads, and, approximately, by implementation of the data containing in the literature.

It is important to prevent any part of the unit being drawn through the sand, and thus the nozzles must be so positioned that the leading jets clear a path ahead of the unit. This is, of course, particularly important where several runs have to be made, since the pipeline will become partially embedded during the initial run.

OPERATING METHOD

Interplay between unit, pipeline and bed

While the simplicity of the unit renders description of its operation superfluous, the manner in which it is employed is of such importance for the final result as to warrant detailed examination.

First, let us examine an actual run (for this purpose, the extremities of the pipeline will be ignored). At any given moment during the run, one part of the pipeline is still resting on the bed, while the other part is undertrenched.

Because of the rigidity of the pipe, the unsupported section will assume a gentle S-bend into the trench. If we observe the pipe at the point, where it is just undertrenched, we see that, while the trenching unit continues to advance, the pipe slowly sinks, but is still free of the bed on which it will rest. In the meantime, sand, disturbed by the jets or flowing or tumbling from the walls, is filling the trench, with the result that the pipe cannot sink to the intended depth. Assuming that the ductility of the pipeline is equal throughout its length, a very high towing speed will reduce the time during which a given length of pipe remains free of the bed, and thus silting of the trench will be minimal. However, a very high towing speed means



fig. 7

that the jets have only a limited time in which to dislodge and disperse the sand, and this in turn means that the initial depth of the trench will be small.

Naturally, a deeper trench is produced at a lower speed, but in the time which the pipe takes to settle the trench becomes largely silted up.

Thus, neither of these methods produces optimum results.

The relationship between towing speed and trench depth is shown in Fig. 4, while in Fig. 5 the degree of silting is plotted against time.

It will be clear from the foregoing that the results of a trenching operation of this nature are influenced by a number of factors, viz.

1. rigidity of the pipeline
2. pipeline mass per unit of length
3. siltation rate
4. soil characteristics, e.g. firmness of the bed, grain size, wall slope, etc.
5. jet power
6. towing speed (speed of motion of the unit over the pipeline).

The first two determine the length of jetted trench into which the pipeline has still to settle. The deeper the trench, the greater the length. The silting rate and the soil characteristics are self-explanatory; in fact, these are interwoven, but the influence of the silting rate on the final result justifies a separate heading.

The jet power is in fact constant. In all cases the maximum available power will be directed to the jets, and this factor forms a constant quantity for a given project.

The only variable factor is the towing speed, which should be such as to produce the optimum result (it being assumed that the towing power available is adequate to produce the desired speed).

Where siltation as a function of time (Fig. 5), trench depth as a function of speed (Fig. 4), and pipeline ductility are known, the approximate settling rate of the pipeline can be calculated.

The ductility of the pipeline determines the distance between the point reached in the trenching run and the point where the pipeline has come to rest in the partly silted trench. This distance also depends upon the depth of the trench. At a particular towing speed, this dimension will correspond to a particular time value, viz. the silting time. This value corresponds to a certain percentage of siltation (Fig. 5), and this must be subtracted from the jetted trench depth (Fig. 4) in order to arrive at the effective depth.

It will be clear that in these computations the estimated depth of a silted trench must be taken as the datum, and that the estimates will have to be corrected several times before the correct result is obtained. If calculations are made for a number of trenching speeds, a graph such as the one in Fig. 6 will be obtained. It will be seen that the curve representing the settling rate of the pipe during each run, as a function of the towing speed, is fairly flat.

Results of model tests

The scale model tests conducted by the Mineral Technological Institute showed that the optimum trenching depth for each run corresponded to a very high towing speed. It was calculated that, for example, a pipeline having a diameter of 1.60 m (5'3") can be embedded to a depth of 1.00 (3'3") in a single run at a towing speed of 0.5 knots. It was established that, with a specially constructed unit and making a number of runs in succession, a pipeline can be embedded to a depth equal to twice its diameter.

With some poorly constructed units the maximum towing speed is limited by sharp rises in towing forces and by the fact that the trench assumes unsuitable dimensions, e.g. narrower than the diameter of the pipe which it is to accommodate.

Summary

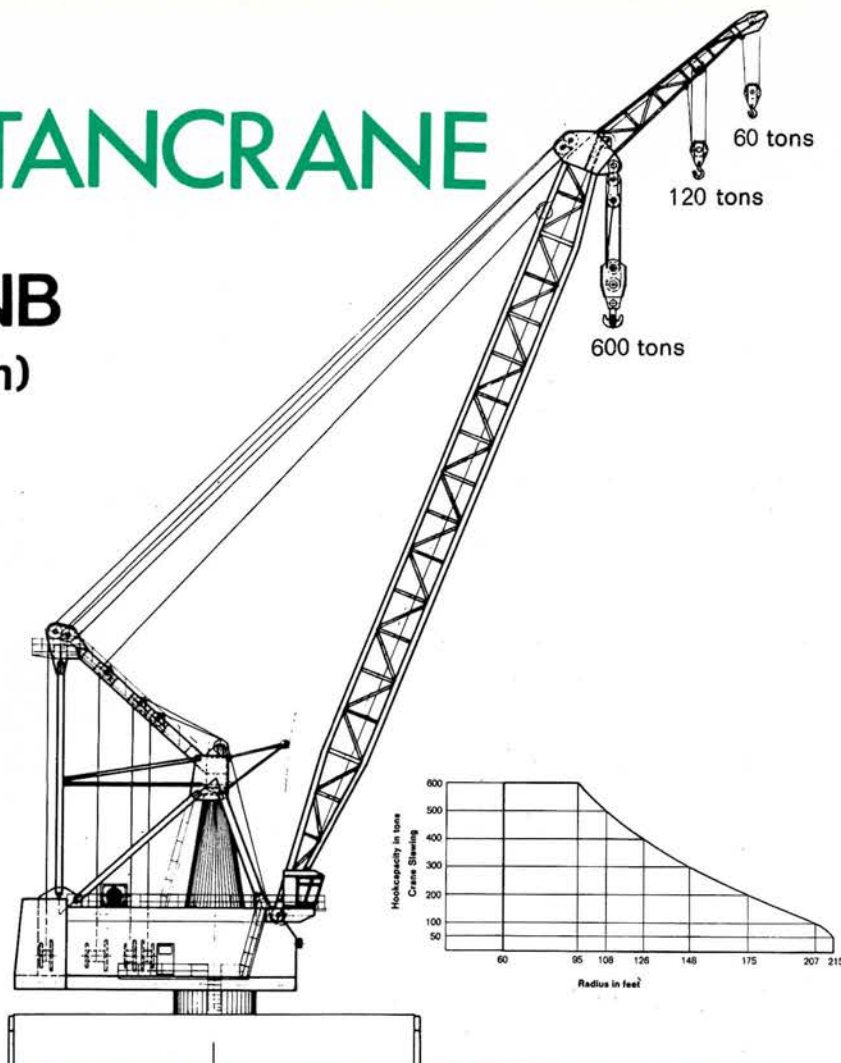
The foregoing shows that, because of their high operating speed, trenching units employing water jets can be used to embed pipelines in a sandy bed simply and inexpensively, and that by carrying out model tests in advance it can be ascertained whether a particular unit is suitable for a specific project and what operating speed is required to produce optimum results.

References

1. Great depth dredger, Jin Matsuda
Kon. Vlaamse Ingenieursvereniging, Proceedings of the 4th International Harbour Congress, 22nd-27th June, 1964, Department IV, Section 3, pp 195 et seq.
2. Anwendung des hydromechanischen Kohleschneidens zum Vortrieb von Entwässerungsstrecken, Prof. Dr. Ing. Hans Matschak et al, Bergbau-technik, Vol. 12, No. 9, September 1962, pp 543 et seq.

I.H.C. STANCRANE

SERIES NB (Normal Boom)



I.H.C. STANCRANE NB series

type	600	500	400	300	225	150
main hoist load (t)	600	500	400	300	225	150
at radius (ft)	95	90	85	80	75	70
1st aux. hoist (t)	120	120	90	90	40	40
2nd aux. hoist (t)	60	60	45	45	—	—
rated power (bhp)						
hoisting	600	600	450	450	300	300
derrick	450	450	450	450	300	300
slewing	250	250	200	200	150	150
auxiliary	130	130	130	130	100	100
tail swing (ft)	48	48	43	43	38	38

200 ft boom (heelpin to main block) on all types

The I.H.C. STANCRANE range is a product of long experience in the design and construction of floating cranes. The range comprises 12 types (a further two are in an advanced stage of development) designed specially for offshore operations.

Besides robust construction, simplicity of control, high safety and low maintenance requirement, these multi-purpose cranes embody many features hitherto lacking in offshore equipment of this type. Among their principal advantages are:

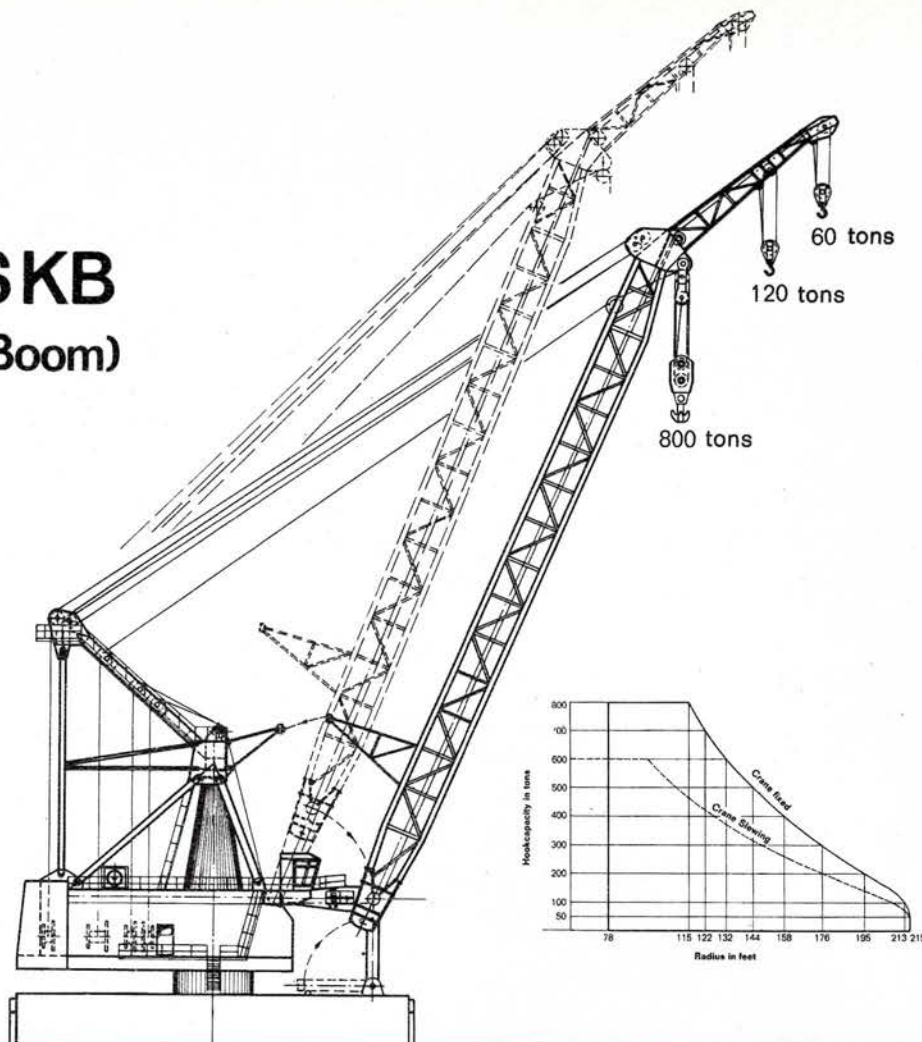
- extremely favourable load/radius ratio;
- ample free space beneath the boom, permitting

bulky loads to be hoisted to a considerable height without fouling the boom;

- patented I.H.C. pivot bearing. This requires no maintenance; the combined weight of the crane and its load is absorbed by a hydrostatic oil film, thereby eliminating wear on mechanical parts;
- stability. The crane hugs the supporting pivot thereby maintaining its stability regardless of weather conditions and the trim or list of the barge;
- working space. The design of the crane column and superstructure is such that ample deck space

SERIES KB

(Kneeling Boom)



I.H.C. STANCRANE KB series

type	600/800	500/700	400/550	300/400	225/300	150/200
fixed:						
main hoist load (t)	800	700	550	400	300	200
at radius (ft)	115	110	105	95	90	85
slewing:						
main hoist load (t)	600	500	400	300	225	150
at radius (ft)	95	90	85	80	75	70
1st aux. hoist (t)	120	120	90	90	40	40
2nd aux. hoist (t)	60	60	45	45	—	—
rated power (bhp)						
hoisting	600	600	450	450	300	300
derrick	450	450	450	450	300	300
slewing	250	250	200	200	150	150
auxiliary	130	130	130	130	100	100
tail swing (ft)	48	48	43	43	38	38

200 ft boom (heelpin to main block) on all types

remains free. A man of average height can walk under the superstructure;

- choice of power systems. I.H.C. Stancranes are available with

D diesel
AC alternating current
DC Ward-Leonard;

- all types can be fitted with a patented kneeling boom "KB" which enables the crane to be rapidly converted to a sheerleg with a substantially higher hoisting capacity at a given radius, without the need to re-reeve cables or shorten the boom;

- these cranes can be delivered in sections for assembly anywhere in the world;

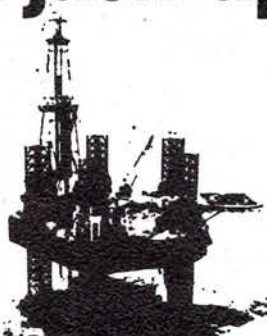
- all types are fitted with a load moment warning device to prevent overloading of the boom.

I.H.C. Stancranes can be mounted on a standard barge and fitted with any of the following equipment to meet specific operating requirements:

standard warping winches
standard load control winches (tugger winches)
boiler room
steam line for piledriving
load indicator or recorder.



Optimal jack-up rigs.



Pentagonal jack-up rig for Sea Drilling Netherlands.

By I.H.C. HOLLAND

Offshore Division, P.O. Box 11, Schiedam, Holland, 'Phone (010) 260420, Telex 23159.