OPU 20

IHC Riser and Guide line tensioners

IHC offshore division

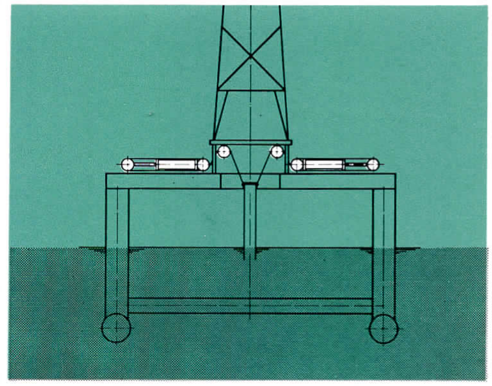
IHC Motion Compensating Devices

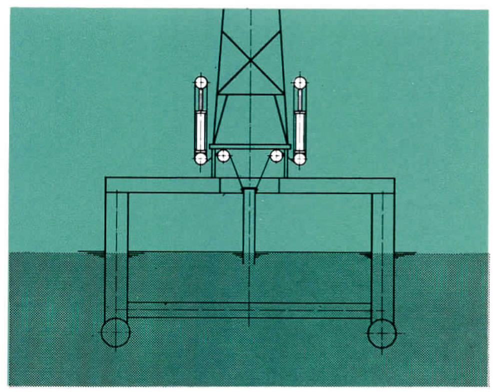
The method used to support a marine riser is one of the critical items for deep and rough water drilling. As well as having to support its own weight, a riser has to withstand forces exerted by both currents and waves, and the differential pressure exerted from outside by seawater and drilling fluid inside. Other forces will tend to displace the riser away from the vertical, and there will be a tensile load applied at the surface.

Economic dredging depends substantially on keeping the suction head on the sea bottom even in roughest weather.

As far back as 1937 IHC Holland perfected a system which compensated suction-hopper heave sufficiently to maintain the draghead constantly on the sea bed.

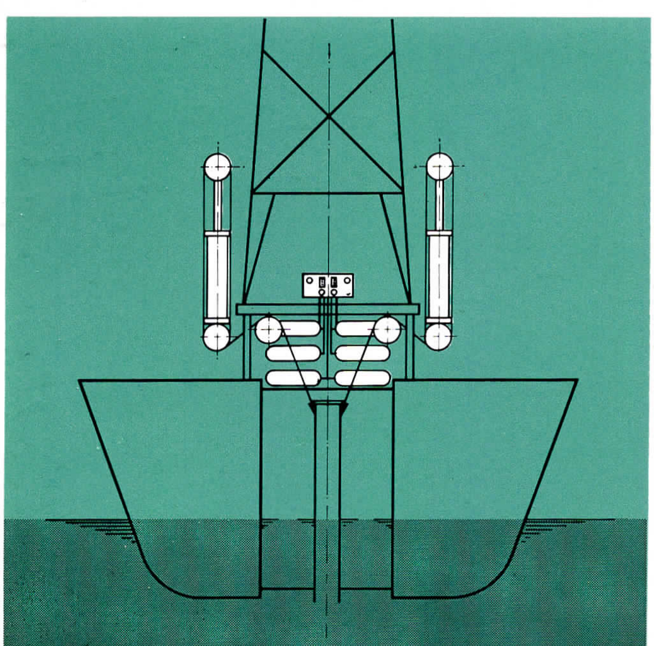
Know-how gained in the manufacture of more than 200 successful marine motion-compensating devices was applied to the design of a series of units specifically applied to maintain constant tension on marine risers and guidelines. Field performance has confirmed the validity of the design even at high conductor weights. The constant tension set at any given time can be maintained constantly between such narrow limits that IHC riser and guideline tensioners are now used for the final landing of damage-prone equipment onto its subsea location. The very low overall line tension deviation includes the effects of the theoretical force variation of the tensioning device plus hydraulic losses and mechanical friction.

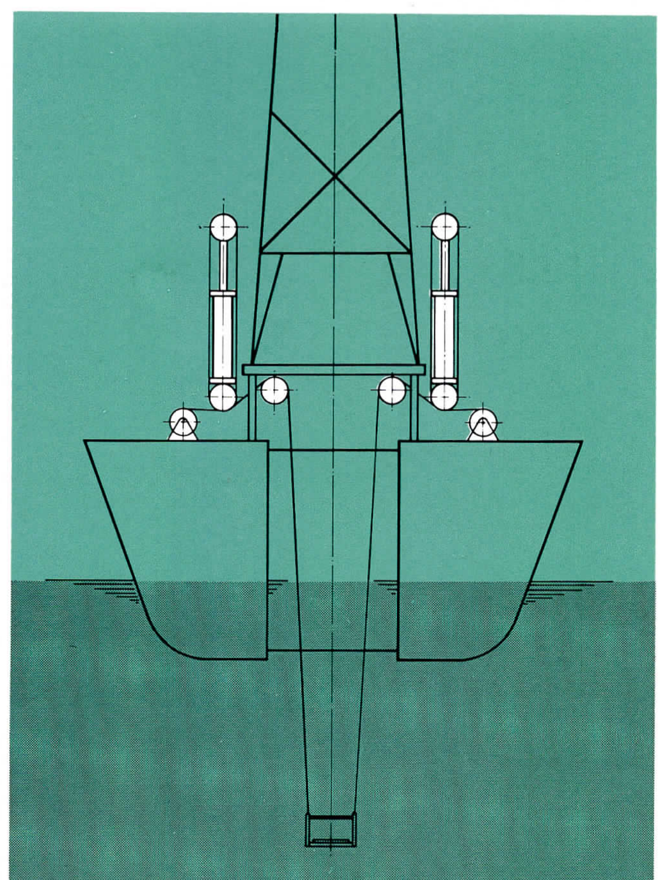




Other significant features of IHC constant-tension equipment are:

- tension adjustment to within close limits;
- easy monitoring and control of the system via a central panel: only minimum operator attention required;
- a built-in safety device brakes the piston speed effectively at cable breakage and protects the system from damage.

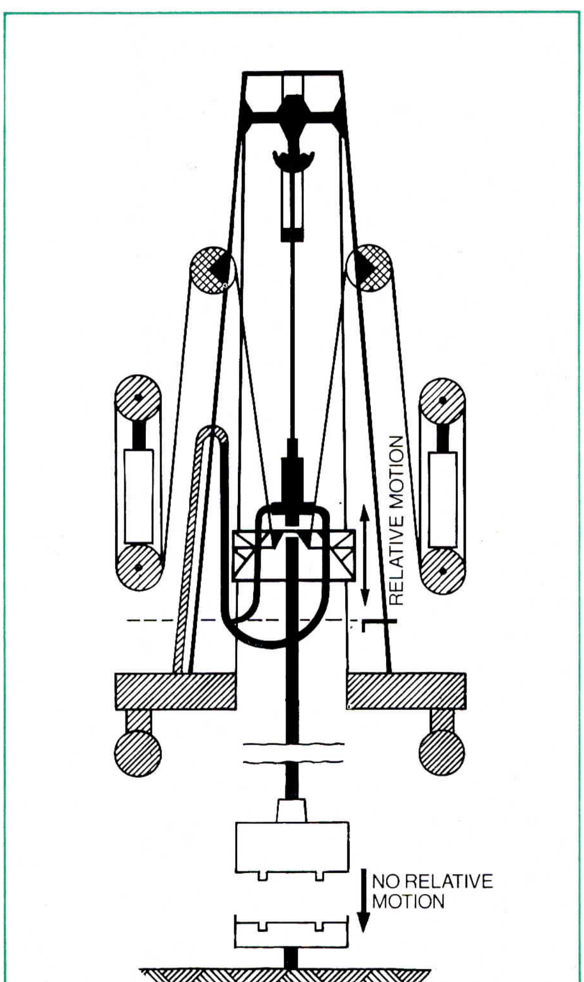


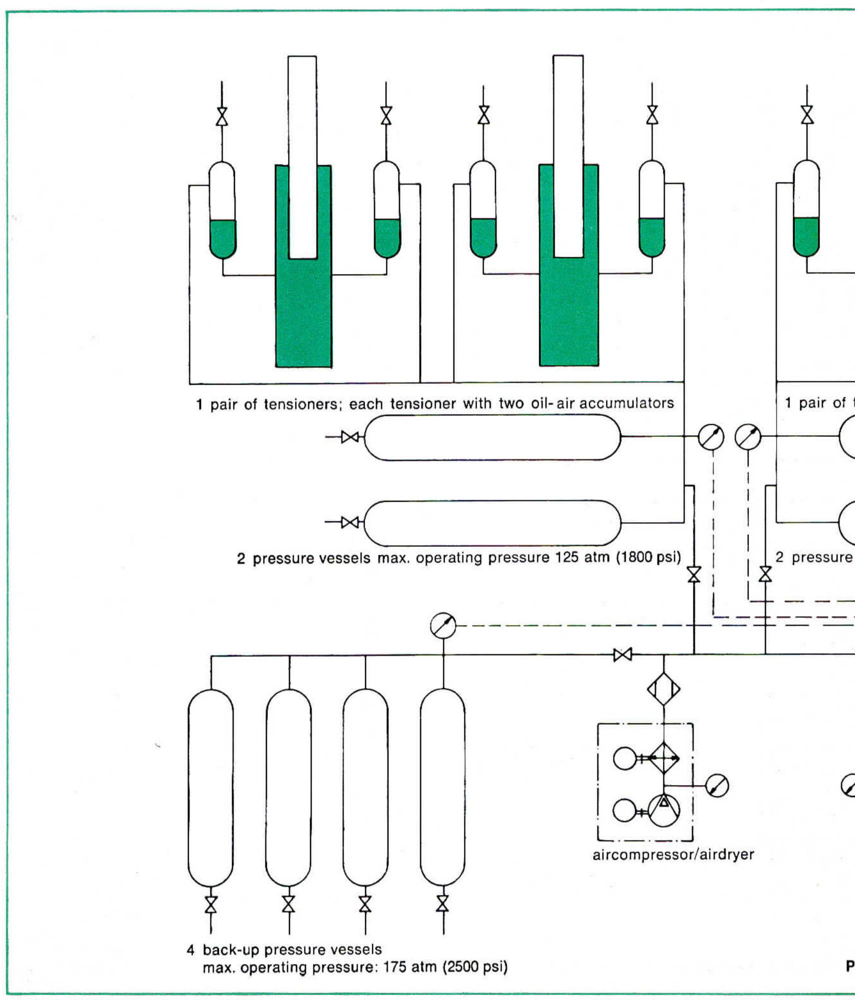


How it works

Tension applied to wirelines is maintained constant by the IHC unit taking up and paying out line as the vessel rides the crest or drops into the trough of a wave.
The tensioning line is reeved over a series of antifriction bearing sheaves located at the movable and fixed ends of the constant-tension unit. Tension is maintained constant on the line by air hydraulic pressure generated in two accumulators. Changes in the air-hydraulic pressures extend or retract the piston which in turn reduces or increases the free length of the tensioning line.

Any upward movement of the vessel will cause an increase in the amount of tension applied to the tensioning line. This causes the piston to retract and so increase the free length of the line until the applied tension is reduced again to the preset value. As the vessel moves downwards into the trough of a wave, the reverse will occur: applied tension on the line will be decreased, the piston will be extended and the free length of the tensioning line will be shortened until the pre-set tension is again reached. Fast and accurate response to any changes in applied tension has been achieved by employing multiple sheaves: overall piston travel is restricted to only a small fraction of the total movement of the tensioning line.
Air pressure in the accumulators of the constant-tension unit will determine the tension achieved. To limit the range of air pressure variation in the cylinder as the piston position changes, the unit is interconnected with an air-pressure reservoir. The volume of this pressure reservoir determines the variation in tension with movement of the piston. In IHC constant-tension systems, standard pressure reservoir volumes are those which result in 3 % tension variation (based on air expansion) with heaves of 12 ft and an amplitude of 6 secs. with the piston operating about its midstroke position.
An advantage of using the accumulator method with compressed air contained in a back-up vessel is that compressed air will only require feeding into the system at infrequent intervals since there are no air losses by venting. A high-pressure, low-volume compressor is adequate to provide the very small volume of high-pressure make-up air required. The compressor system also includes an airdryer which will remove moisture and safely prevent condensation within the system.
For normal applications two high-pressure air hydraulic accumulators will be arranged either on or in the close vicinity of the constant-tension unit: both will be connected to the cylinder which is completely filled with oil for continuous lubrication and to provide a stroke cushioning effect.
At wireline breakage the piston will be automatically extended to its fully out position. To prevent unnecessary strain on, or possible damage to the constant-tension unit and other associated equipment, the piston has been fitted with a patented safety feature which adequately controls the speed of the moving piston.
The constant-tension device is operated and controlled from a single central panel.





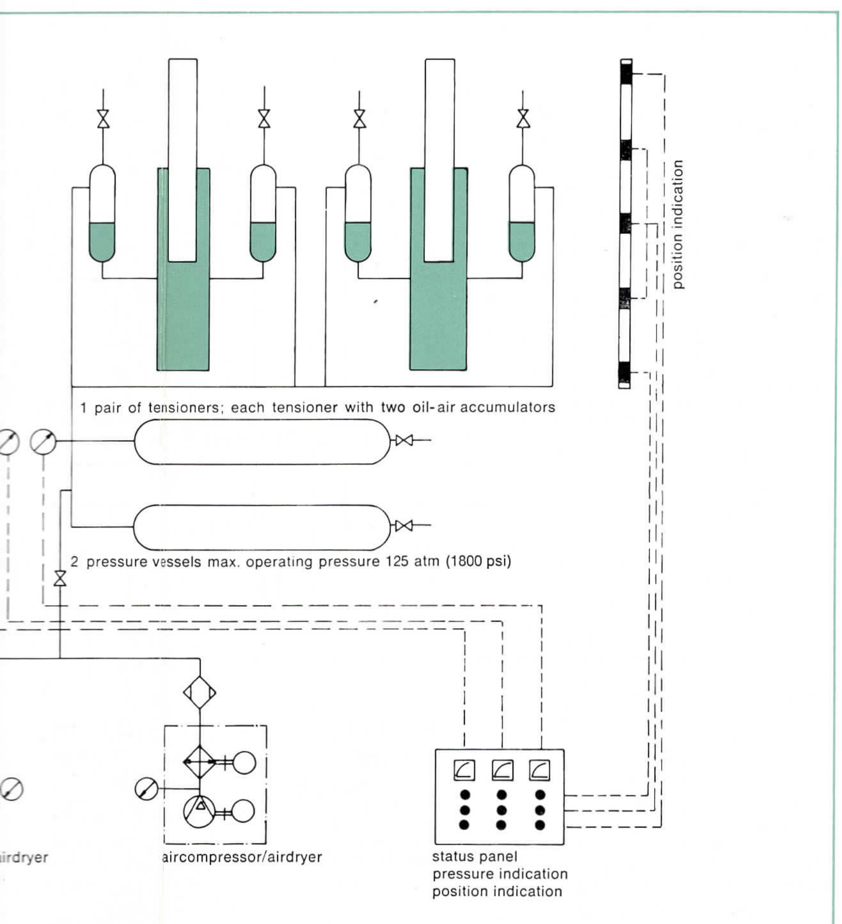
Standard equipment

The range of standard equipment comprises four units – one primarily for use to maintain constant tension on guide lines; the other three for use with marine risers. Other non-standard sizes are able to meet specific requirements.

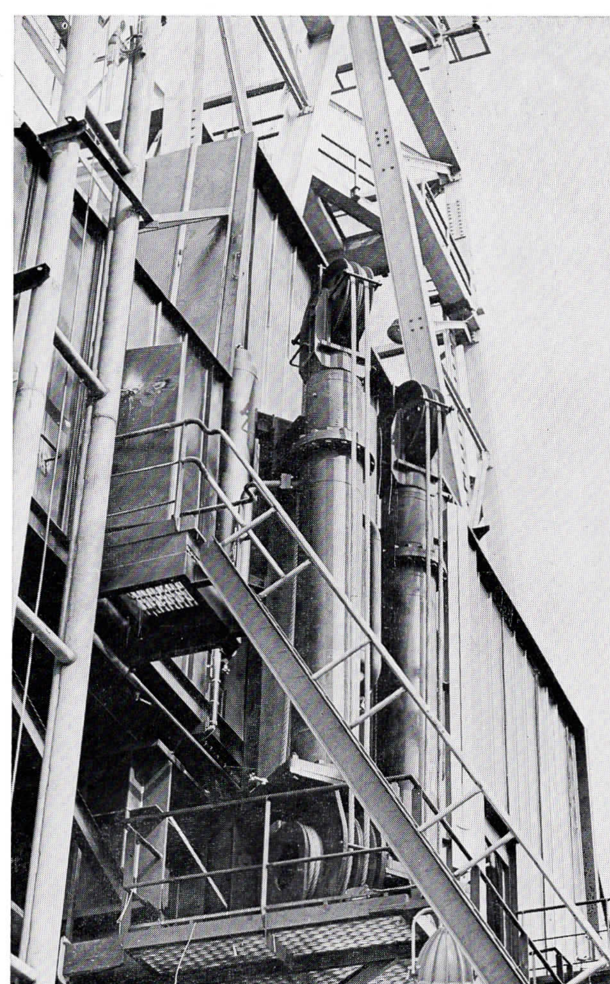
Single Line Tension max.		Line Travel max.		Remarks
lbs.	kg.	ft	m	
16,000	7,250	40	12	A four-unit system for maintaining constant tension on guide lines; normally combined with guide-line winches.
70,000	31,750	40	12	A system for maintaining constant tension on marine risers, comprising from one to four pairs of interconnected constant-tension units. Since the lines maintained under tension are attached to each side of the riser, a uniform axial tension will be applied at all times.
85,000	38,500	40	12	
100,000	45,250	40	12	

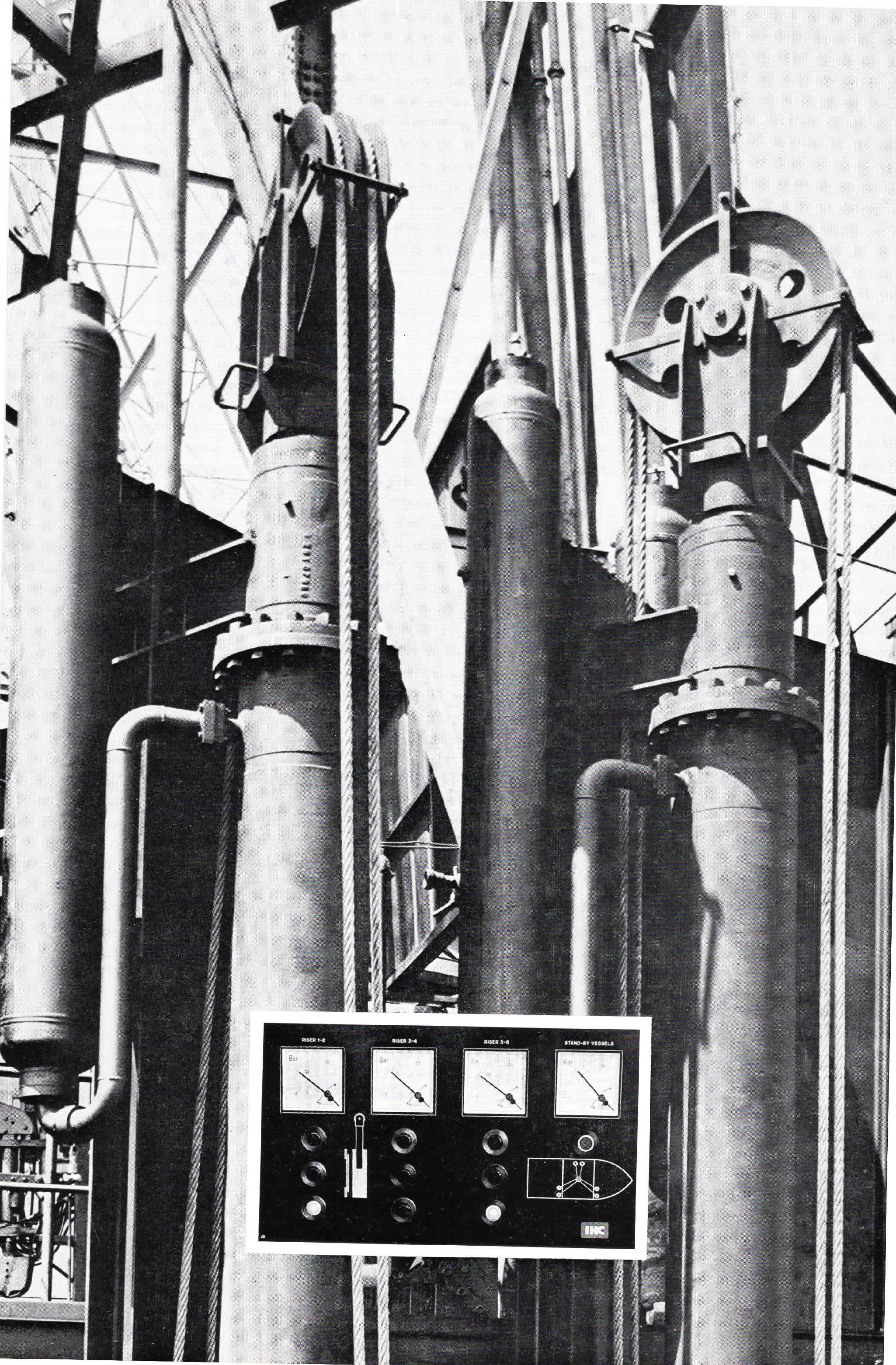
A total constant-tension system comprises:

- a set of constant-tension units each comprising a main cylinder, piston, a pair of double sheave assemblies, and two air-hydraulic accumulators.
- a set of air-pressure reservoirs.
- a set of back-up pressure vessels.
- a control panel with full monitoring and control equipment.
- a remote control panel.
- one or two air compressor units with regulators and air drying units.
- an adequate number of idler pulleys for cable guiding.



Pneumatic and hydraulic scheme for two pair riser or guideline tensioners




RISER 1-2
RISER 3-4
RISER 5-6
STAND-BY VESSELS
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