بسم الله الرحمن الرحيم

CPAS مركز الدراسات التخطيطية والمعمارية

CENTER OF PLANNING AND ARCHITECTURE STUDIES

الدورة التدريبيه الرابعه

" ادارة عمليات التشييد والبناء "

مجموعة محاضرات

م . باسم بطرس أبادير

لعام ١٤٠١هـ - ١٩٨١م

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١٤ ش السبكى منشية البكرى - هليوبوليس - القاهرة - ج . م . ع
ص . ب : ٦ سراى القبة - تلغرافيا : اربلانك .
ت : ٦٠٣٨٤٣ - ٦٠٣٣٩٧ تلكس : ٩٣٢٤٣ CPAS UN

الاساليب الحديثة لصب

الخرسانة

- الخرسانة ... ماهى؟.... لماذا.....؟

- صفات اساسية:

التدرج - محتوى الاسمنت - نسبة $\frac{\text{الماء}}{\text{الاسمنت}}$ - القوام - محتوى الناعم

الشك: ابتدائى - نهائى - الوزن النوعى

- الانشطة الاساسية:

انتاج - نقل - تشكيل

الانشطة الفرعية:

تشوين المواد - الدك - المعالجة

- اساليب الانتاج:

يدوية

الخلاطات

محطات الخلط

- اساليب النقل:

يدوية

المزاريب (ماهرة الانفصال)

الكبارى

السيور الناقلة

البريمة الناقلة

القلابات الكبيرة والصغيرة

سيارات الحلة الدوارة

الاوناش

الاوناش البرجية

طلمبات الخرسانة (

مقطورة - محملة على شاسيه مركبة، بخط انابيب - ببومة صب

النقل بالهواء المضغوط

- الآلات ذات الوظيفة المشتركة:

الخلاطات ذاتية الحركة.

- الـــدك والمعـــالجـــة :

الهـــزازات الـداخليـــة

الهـــزازات الخـارجيـــة

- صـب وتشكيـــل الخرســـانة :

الشـــدات الخشبيـــــــــة

القـــوائـــم المعـدنيـــة

الشـــدات المعـــدنيـــــة

الشـــدات النمطيـــــــــة

الالـــواح المتكـــررة - النفقيـــة - المنـــاديق

الشـــدات ذاتيـــة الرفـــع

الشـــدات المنزلقـــــــة

- الخرســـانة ســـابقـــة الـجهـــز:

1. Good concrete - the most important factor in pumping

When delivering concrete through piping the correct concrete mixture is the decisive factor for profitable and economical operation. When pumping concrete therefore, considerable care must be devoted to the mixture composition. Because wet or excessively lean concrete is more difficult to deliver than quality mixtures the concrete pump is a guarantee of quality.

Do not make the mistake of trying to pump every possible type of mixture occurring on the building site. The resultant troublesome and costly blockages will prejudice your colleagues against the use of a concrete pump and will cause considerable losses.

It is important that you accurately determine and check the mixture composition before commencement of pumping.

No experiments at the start!

When you start pumping use a mixture that will run freely and free of blockages so that your people can get used to the machine. Save your concrete experiments for later. You should, therefore, order the following composition from your concrete works (for concrete grain mix up to 30 mm):

Aggregates exactly to grading curve E, i.e. per cubic metre

840 kg	Sand	0 - 3 mm
220 kg	Free-flowing material	3 - 7 mm
400 kg	Gravel	7 - 15 mm
500 kg	Gravel	15 - 30 mm

Cement content 320 kg/cu.m
Consistency K2/K3, i.e. slump 2 and more inches.

This mixture is usually easy to pump even if it contains broken particles.

Where the sand contains large quantities of fines (mo) only use approximately 500kg sand content, and for this 640 kg gravel 15 - 30 mm.

Please do not forget to pump through cement slurry before beginning work (4.15).

All the data given here regarding grain diameter refers to round hole screens.

Fig.1
A K1 concrete (1-2 " slump) breaks off as sharply as this when flowing out of the pipe end.

Fig.2
Hoses are easily laid and are stoppage proof.

1.1 Experiences with Mixture Composition

When you have gained sufficient experience with your new CONCRETE PUMP in pumping the mixture detailed above, then you can begin to vary the concrete composition so that you can obtain the most economical and still easily pumpable concrete mixtures with the aggregates locally available for the individual building site. Exact mixture breakdown cannot be stated because sand, gravel and cement have different properties everywhere. However, you apply the information below to your conditions you will find it easy to achieve the required result quickly.

Three important factors are decisive for the pumping qualities of a mixture:

1. Grain composition or grading curve of the aggregates.
2. Content of so-called mo, i.e. grain size below 0.2 mm. By this is understood cement and natural ultra-fine particles (dust).
3. Consistency and water content.

The effect of these three factors overlap, i.e. if for example the mo or cement content is rather low, one can help out with the addition of water or higher sand content or more suitable grain composition in order to still be able to pump through the pipe without blockages. The same applies to unsuitable grain composition, i.e. with too little sand or angular, broken aggregate. Here as well, an improvement can be achieved partly by cement or addition of water. Often the addition of unwashed screenings instead of washed sand can be advantageous after carrying out a suitability test.

To give you more detailed information we will deal further with these three factors.

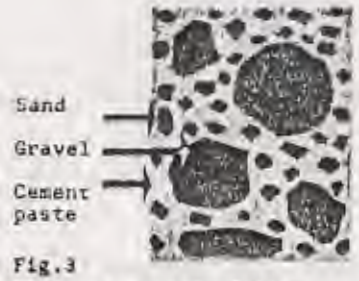


Fig.3
The cement paste fills in the cavities between the sand and gravel grains.

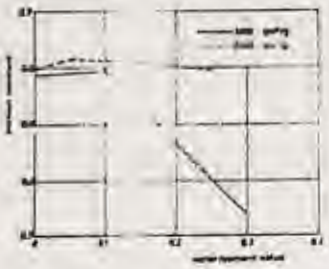


Fig.10

Fig.11

Crushed particles require more sand and mo content

Fig.12

Rounded particles are better for pumping

The regulation mo content is laid down in DIN 1045 as follows:

Rule of thumb: Concrete grain mix 0 - 30 mm must contain approximately 350 - 400 kg mo below 0.2 particle size, i.e. cement plus natural mo (with grain mix 0 - 15 on the other hand 400 - 450kg). With crushed sand go to the top limit.

Experience shows that washed stream sand contains 4 - 6% mo. Calculated on the total aggregates one obtains for washed stream material as a rule 2% mo, i.e. approximately 40 kg/cu.m with an aggregate quantity of 2 tons/cu.m.

As a result, therefore, 300 - 320 kg cement additional [illegible] necessary in order to obtain a standard mo content of at least 350 kg. With lower [illegible] cement one obtains a concrete which bleeds [illegible] which repels water. It also becomes [illegible] difficult to pump and is inclined to form blockages in the pump and pipe.

With 5% natural mo content of the aggregates the same calculation shows that one can work satisfactorily with approximately 250 kg/cu.m. This is provided that the grain composition and the consistency of the concrete are normal. You can see to what a high degree the cement requirement is dependent on the mo content of the aggregate.

Unfortunately, one frequently works with too low mo content because even for low-grade concretes with low cement content washed out aggregates are used. In order then to obtain satisfactory consistency the mo has to be replaced by water which subsequently bleeds out again leaving [illegible] micropores.

To a large extent it is not yet realized that mo is in no way harmful but has an extremely positive effect. It replaces water where the above-mentioned proportions are not exceeded.

Just [illegible] in a mo content which is higher than [illegible] quantities, because excessive mo requires more water and produces sticky mixtures which necessitate high pump pressure.

Substitute for missing mo is stone dust, quarz dust, fly ash, trass etc. which can be added during concrete preparation in quantities in accordance with the standard mo quantities (Standard 350 - 400 kg with grain mix 0 - 30).

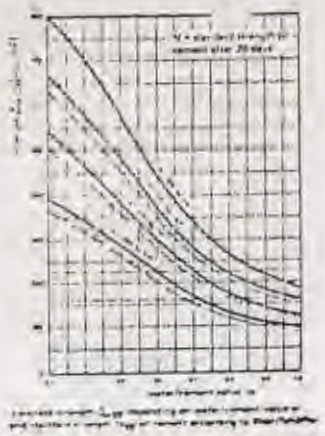


Fig.14

Fig.15

Fig.16

Increase of the natural mo content

Where available unwashed sand, in particular crushed sand can also be added. It is essential, however, that its mo content is measured and that the standard mo quantities are not exceeded. For low grade foundation concretes the last mentioned method is extremely favourable.

Cement types: Recommended are Portland cements. With these one always obtains a better degree of pumping ability than with "short" binders such as iron portland cement or blast furnace cement. Coarse ground and "long" cements are the best.

High grade, fine ground cements can raise the water retention and increase pumping ability. With very high cement proportions a higher pump pressure results as well as very sticky mixtures which with their stiff consistency can only be extracted from mobile mixers with difficulty.

1.13 Consistency of the concrete mixture

For pumping the most suitable are mixtures in the medium consistency range K 2, i.e. slump approximately 2-3 inches. Stiffer mixtures in the K1 range down to 1inch slump have already been successfully pumped. They require, however, suitable grain composition of the aggregates and sufficient mo content, otherwise particularly with extended pumping distances stoppages occur in pipe and pump.

Soft mixtures in the K3 consistency range require much less pump pressure. But they tend to bleed sooner and with long intervals can lead to sedimentation and blockages in the pipe. Here, therefore, sufficient mo content is particularly important. (Also V (concrete liquifiers) and possibly LP (air entraining) materials.

1.131 Determination of consistency ranges:

Consistency	K1 (stiff)	K2 (plastic)	K3 (soft)
Penetration Fig.e (cm)	2 - 6	8 - 15	-
Slump a (cm)	- 35	36 - 41	42 - 50
Compression value V	1.50-1.30	1.25-1.15	1.10-1.05
Powers lift value	25 - 30	17 - 24	below 15
Slump (inch)	1 - 3	7 - 1	over 3

Table 8

Possible rates of concreting from portable single-track bridges

Span of portable bridge, m	Number of tipping lorries of load-carrying capacity 4 t unloaded simultaneously	Possible rates of concreting, m³/hr
10	1	25
15	2	45
20	2	45
30	3	60

For concreting hydraulic structures the mobile bridges with a span of up to 35 m are used (Fig. 41). The bridge

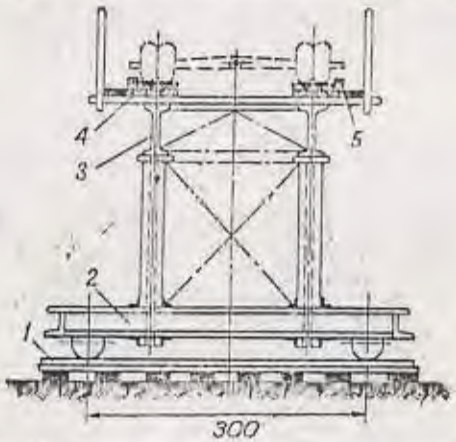


Fig. 40. Diagram of a portable beam-bridge for placing concrete, moved on rails laid on the floor of the excavation:
1 — rails; 2 — carriage; 3 — principal beam of bridge; 4 — deck; 5 — buffer

construction comprises a girder, supports, a carriage on which it moves, and the ramps. For large mass concrete construction use is frequently made of small *transportable concreting bridges* of the stock type (Fig. 42).

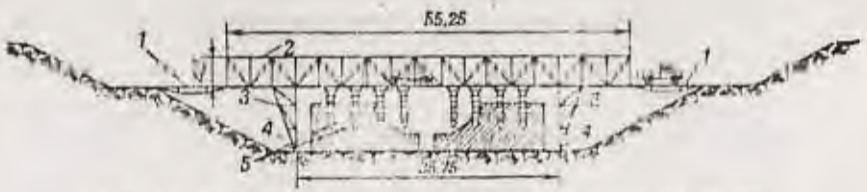


Fig. 41. Diagram of portable bridge of span up to 30 m:
1 — steel ramp; 2 — bridge girder; 3 — supports; 4 — rail track; 5 — trunks

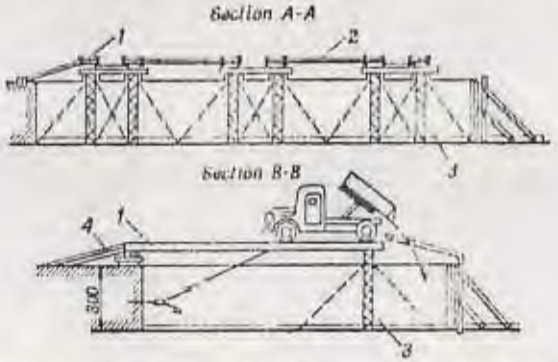


Fig. 42. Diagram of small portable bridge of stock construction:
1 — superstructure; 2 — tie-spreaders; 3 — supports; 4 — ramp

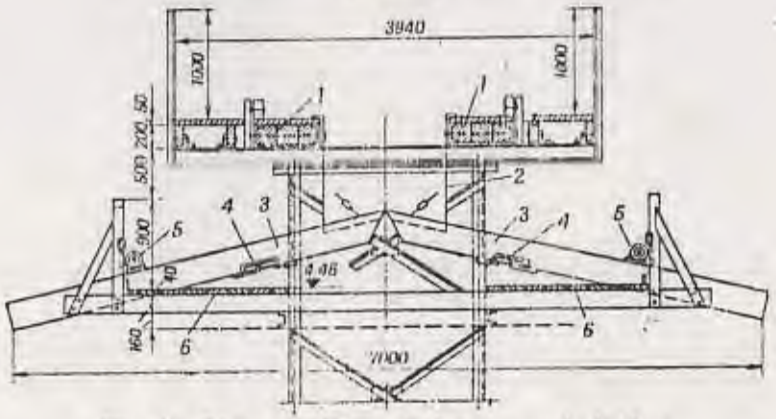
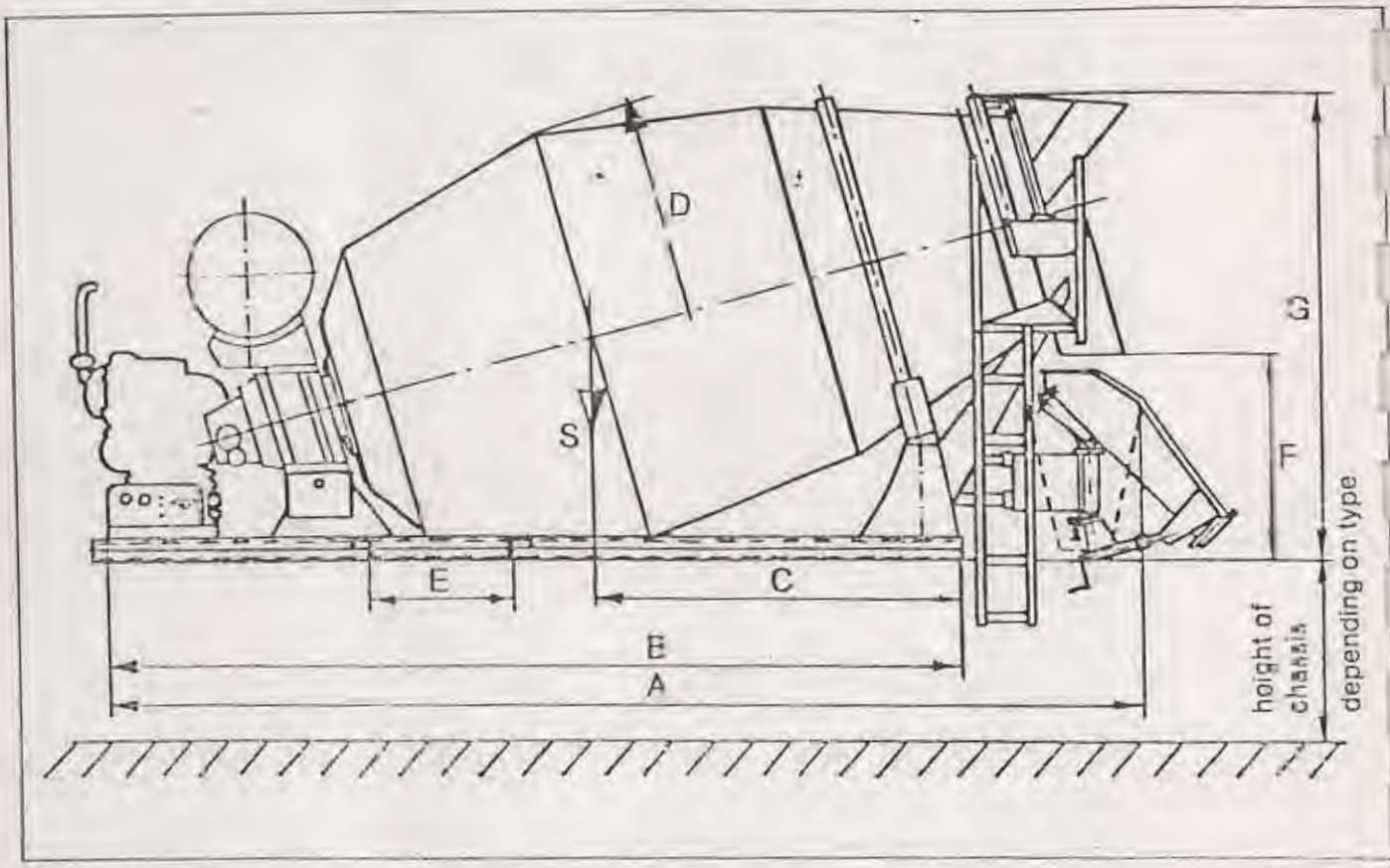


Fig. 43. Diagram of low stationary trestle bridge:
1 — thoroughfare; 2 — hopper; 3 — vibro-chutes; 4 — discharge hatches; 5 — vibrators; 6 — deck for workmen

KA4S KA6S KA7S
KA4F KA6F KA7F



Technical Data KABAG Truck Mixer

On request, 10 m³ Truck Mixers can be offered.
Subject to technical modifications!

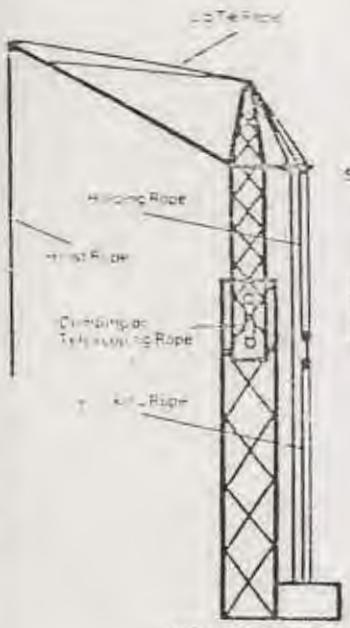
Mixer Type (with separate engine)		KA 4 S	KA 6 S	KA 7 S	Dimens. in mm	KA 4 S	KA 6 S	KA 7 S
Drum holding capacity	m³	4	6	7	A	5100	5500	6400
Geom. drum capacity	m³	8,7	10,35	12,4	B	4100	4500	5400
Number of drum revolutions	1/min	0 – 14	0 – 14	0 – 14	C	1715	2225	2390
Capacity of water tank	l	600	600	600	D	2300	2300	2300
Water pump	l/min	250	250	250	E		766/860/903	
Water meter (Optional extra)	m³/h	10	10	10	F	1150	1150	1340
Water connection	inch	2	2	2	G	2500	2500	2500
Drive motor (Deutz-Diesel 2300 rpm)		F3L 912 38 kW/52 HP	F4L 912 51 kW/70 HP	F4L 912 51 kW/70 HP				
Weight empty	kg	3200	3500	3700				

Mixer Type (Drive from truck engine)		KA 4 F	KA 6 F	KA 7 F	Dimens. in mm	KA 4 F	KA 6 F	KA 7 F
Drum holding capacity	m³	4	6	7	A	5100	5300	5700
Geom. drum capacity	m³	8,7	10,35	12,4	B	4100	4300	4700
Number of drum revolutions	1/min	0 – 14	0 – 14	0 – 14	C	1700	2210	2360
Capacity of water tank	l	600	600	600	D	2300	2300	2300
Water meter (Optional extra)	m³/h	10	10	10	E		766/860/903	
Water connection	inch	2	2	2	F	1150	1150	1340
Power required	rpm	30 kW/40 HP	44 kW/60 HP	44 kW/60 HP	G	2500	2500	2500
Weight empty	kg	3000	3200	3500				

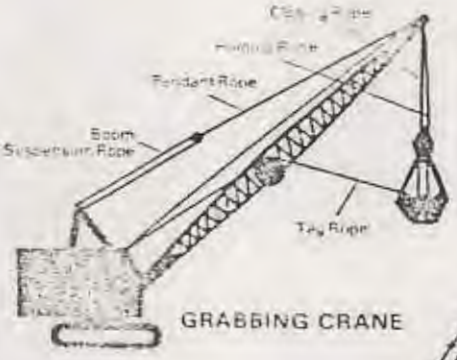
سيارات KABAG الحاملة يمكن تعبئتها عند عدد لفات منخفض ، لفات في الدقيقة لتوفير الاستهلاك و الوقود .

KABAG TRUCK MIXERS can be filled at a drum speed of only 4 revolutions per minute, that means less wear and fuel consumption.

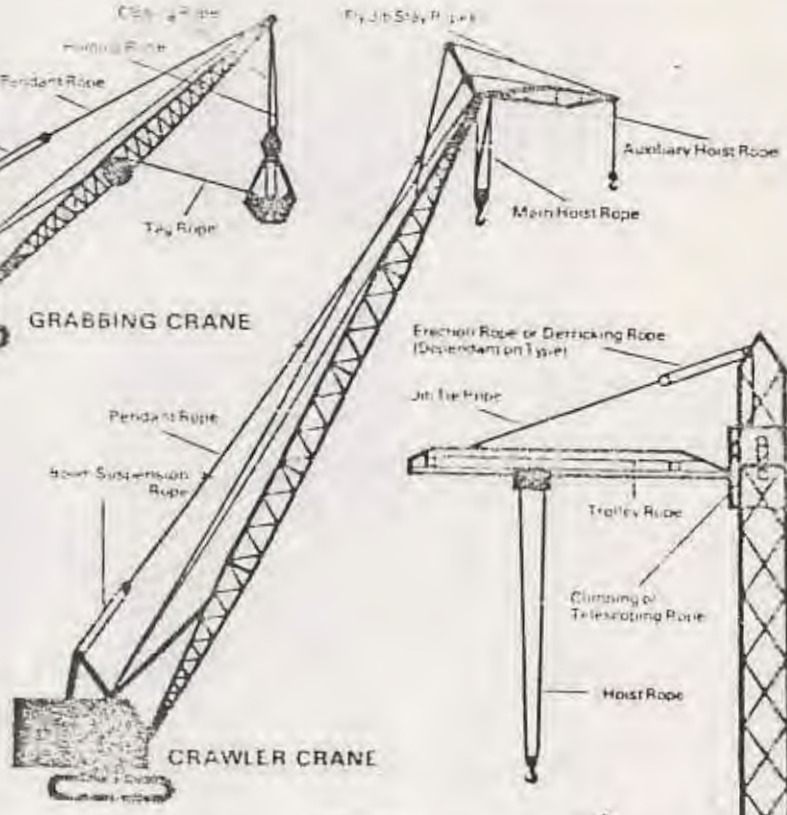
Le remplissage des BETONNIERES PORTEES KABAG peut se faire à une vitesse de la cuve de 4 tours par minute seulement — donc réduction de l'usure et de la consommation en carburant.



TOWER CRANE

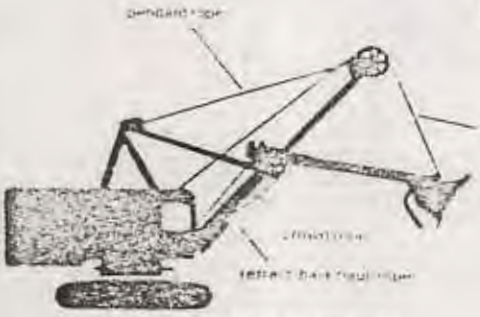


GRABBING CRANE

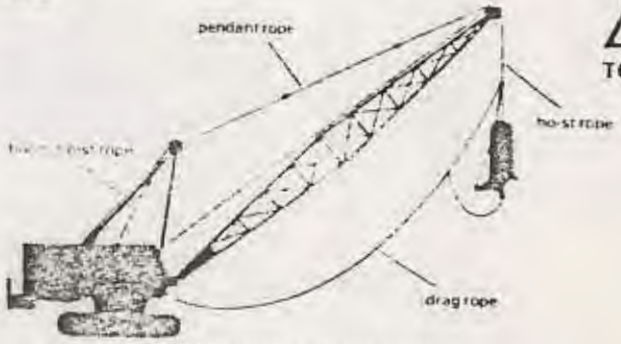


CRAWLER CRANE

TOWER CRANE

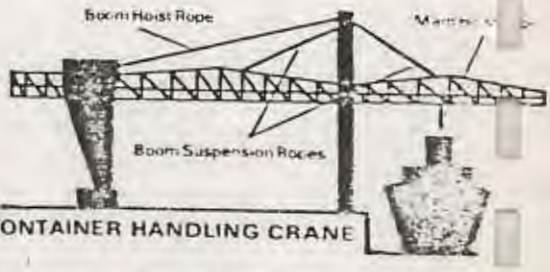


CRAWLER MOUNTED SHOVEL



CRAWLER MOUNTED DRAGLINE

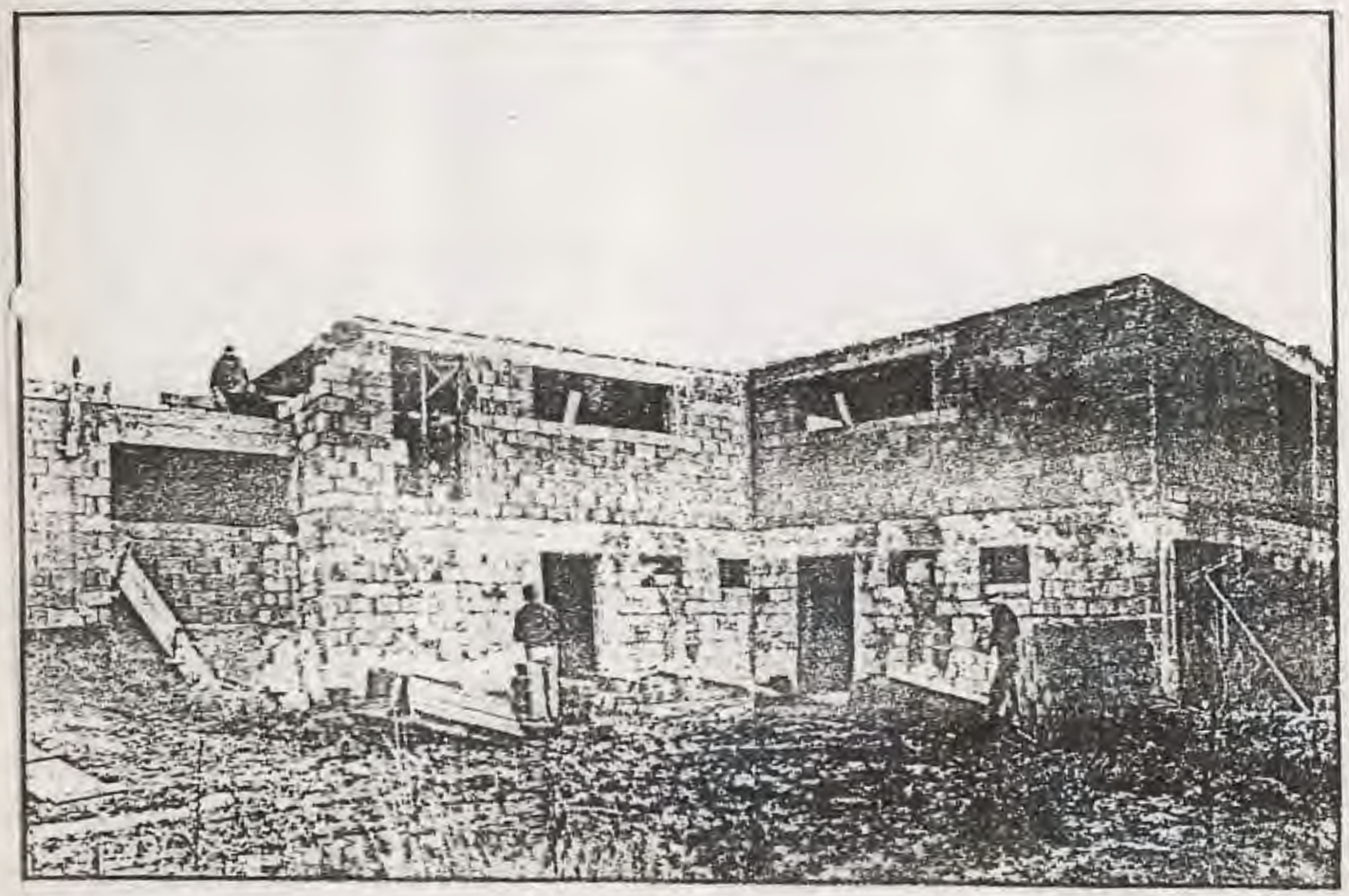
WALKING DRAGLINE



CONTAINER HANDLING CRANE

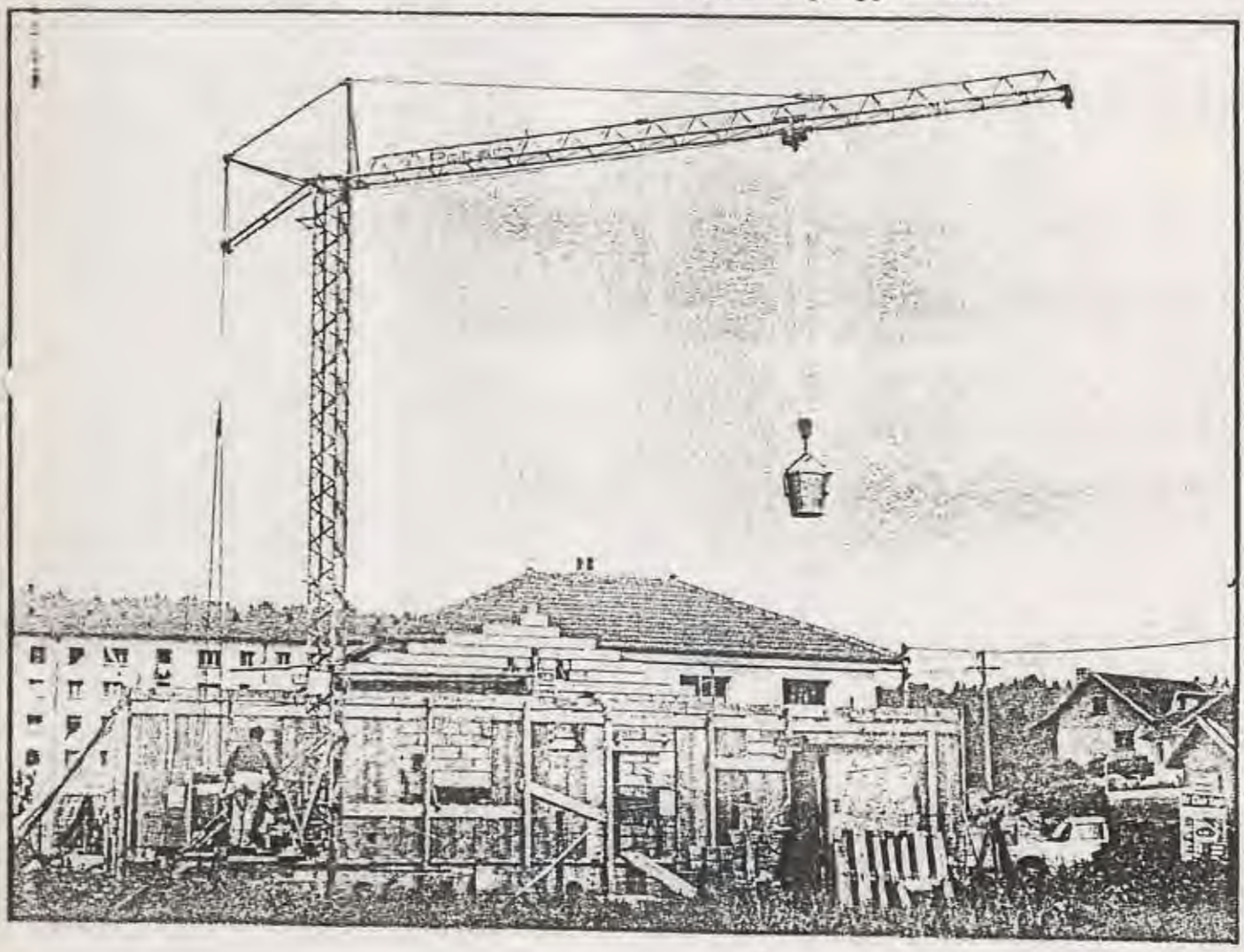
البنـــــاء يـدويـــا ...

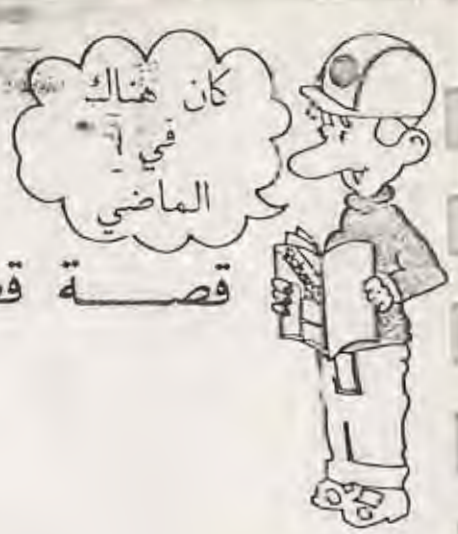
ان هذا ممكنا . ولكنه يتطلب عددا اكبر من الايدى العاملة ، ومن هنا تنتج معضلة التوظيف وتنسيق العمل في الورشة : ان هذا جد معقـــد .
ان بعض المواد تنقل يدويا بصعوبة : فهي ثقيلة ومزعجـــة .
واخيرا ، فان كامل طاقم البناء مشغول في ورشة واحدة .وهذا يعني عـدم تمكنه من بدء عملية جديدة الا بعد انتهاء العملية الاولى فعليا : ان هذه عملية طويلة تؤدى الى ضياع وقتكم ومالكم .



البنـــاء بواسطة الـرافعـــة ...

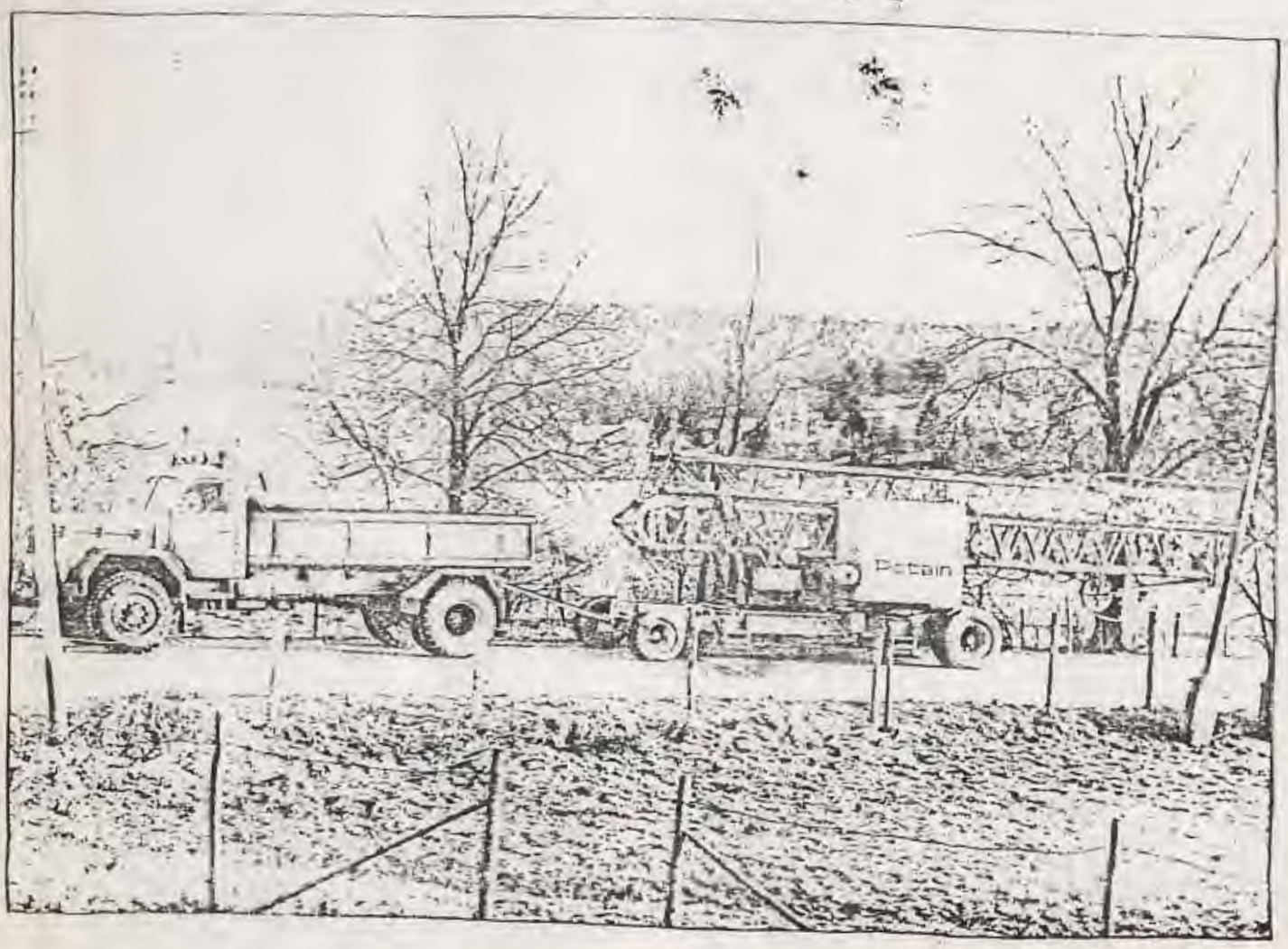
ان الرافعة ذات التركيب السريع ج.م.ر. بوتان هي جد عملية فهي تقوم وحدها مقام عدة اشخاص في الورشة .
كما تحل الرافعة مشكلة التنسيق المعقد بين الموظائف : ان هذا جد بسيط .
كما يمكن لكم بواسطة رافعة ج.م.ر. رفع حمولات تبلغ عدة اطنان : وهذا اقل ازعاجا . واخيرا ، فيمكن لكم في الوقت نفسه توزيع طاقمكم الفني والعمالي على عدة ورشات ومواقع بناء ، وبالتالي ، البدء بعمليات متعددة ان هذا شديد الفعالية ويؤمن لكم توفير الوقت الثمين ، كما يضمن حتما توفير العمال .





قصة قصيرة عن ورشة مريحة

ان رافعتكم تصل مقطورة بشاحنة
عادية على الطريق
وهي تنتقل كاملة ، مطوية ومربوطة
مع ثقالها او بدونها .



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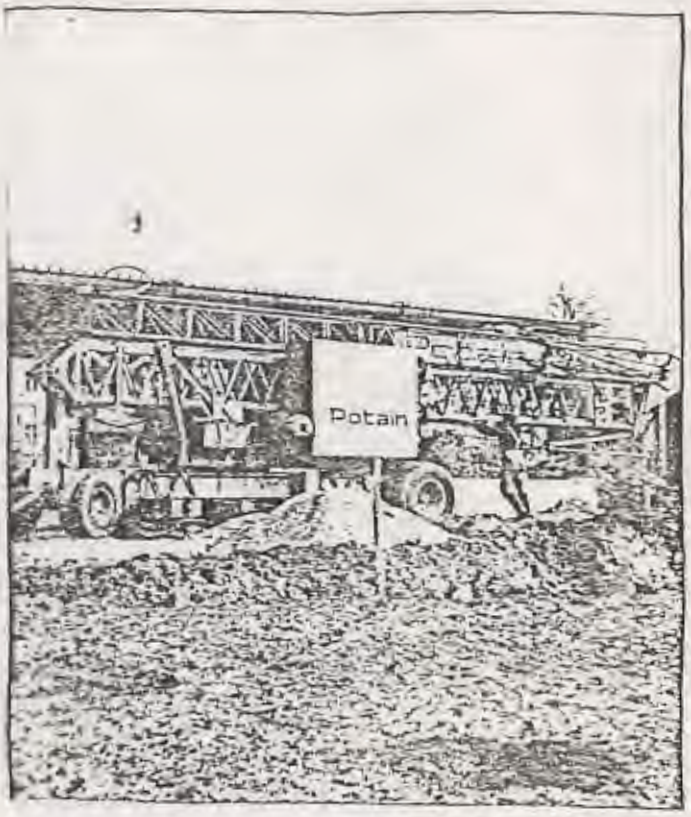
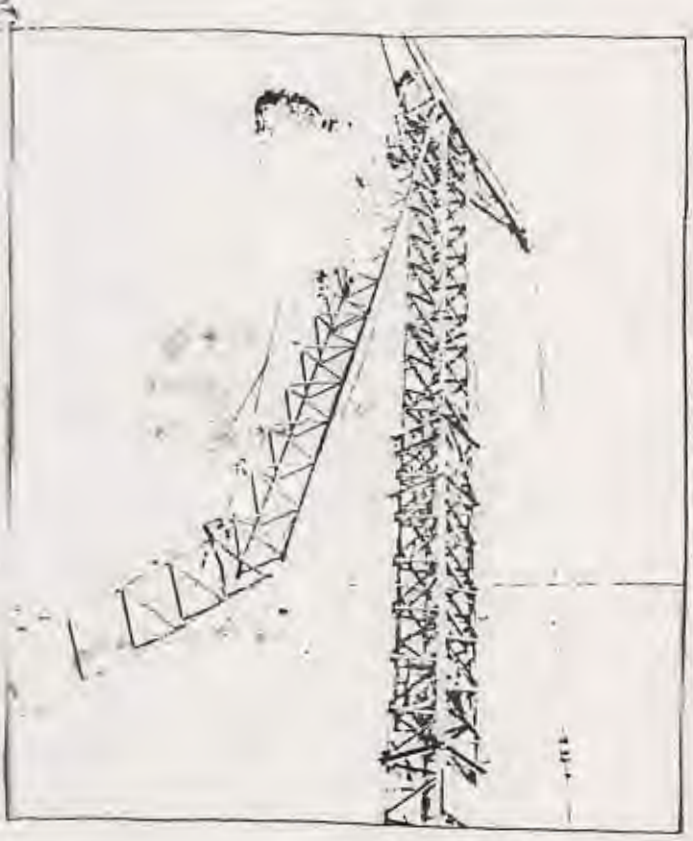
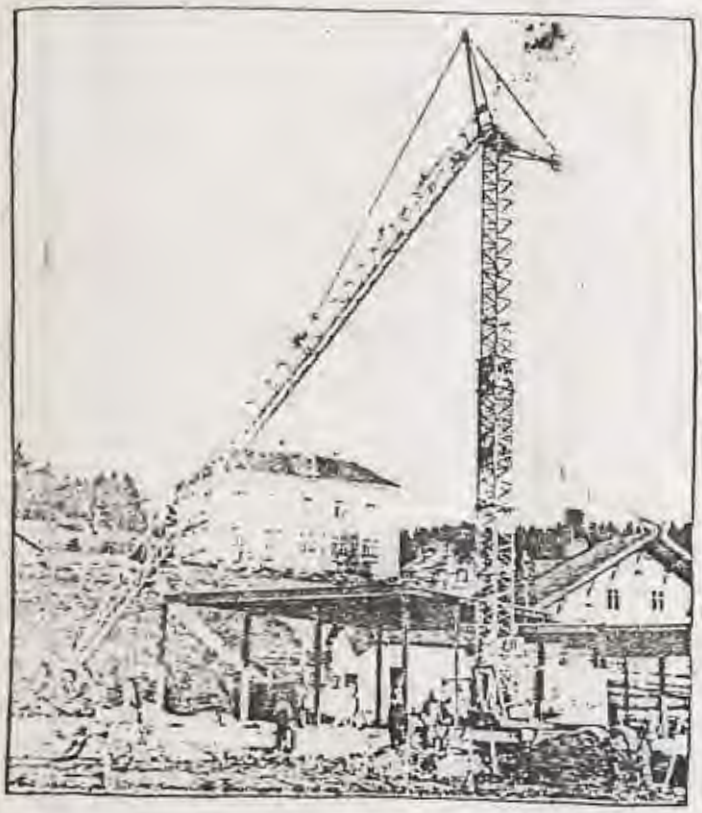


وبضغط بسيط باليد على ازرار علبة القيادة ترتفع المجموعة .

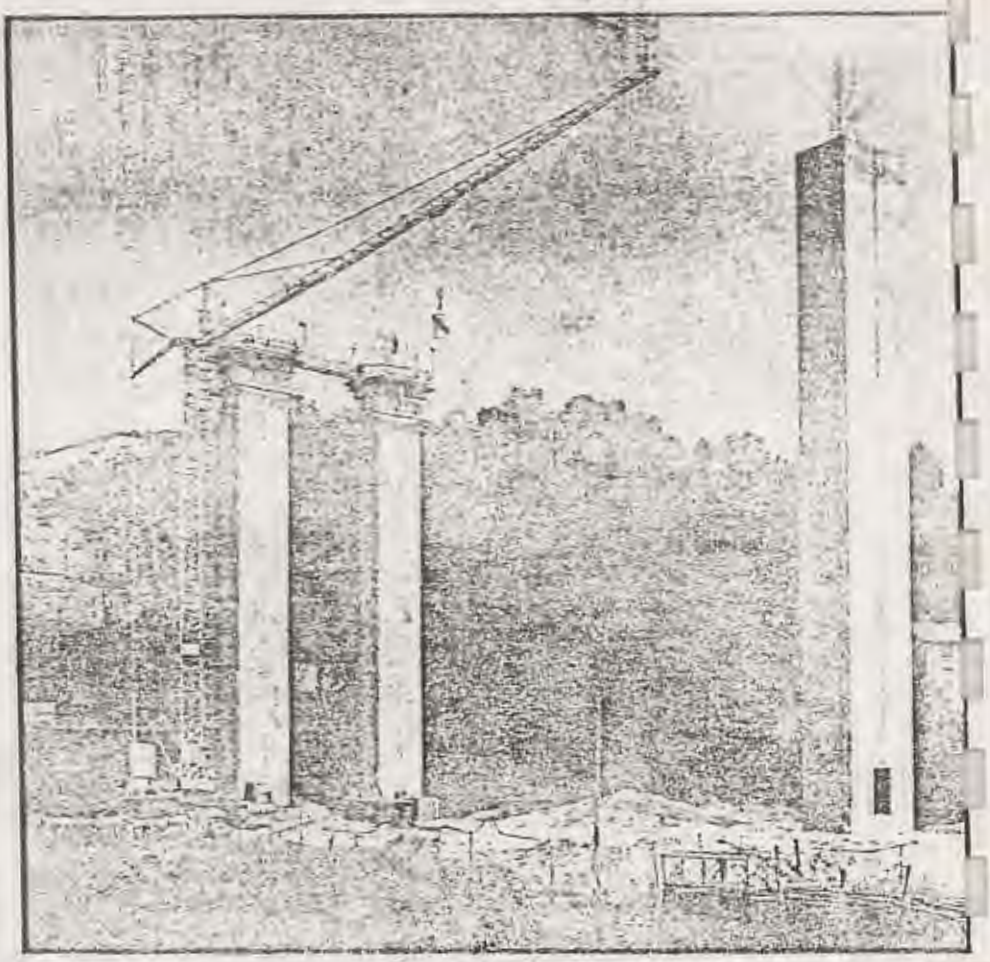


وتتداخل الصارية ..

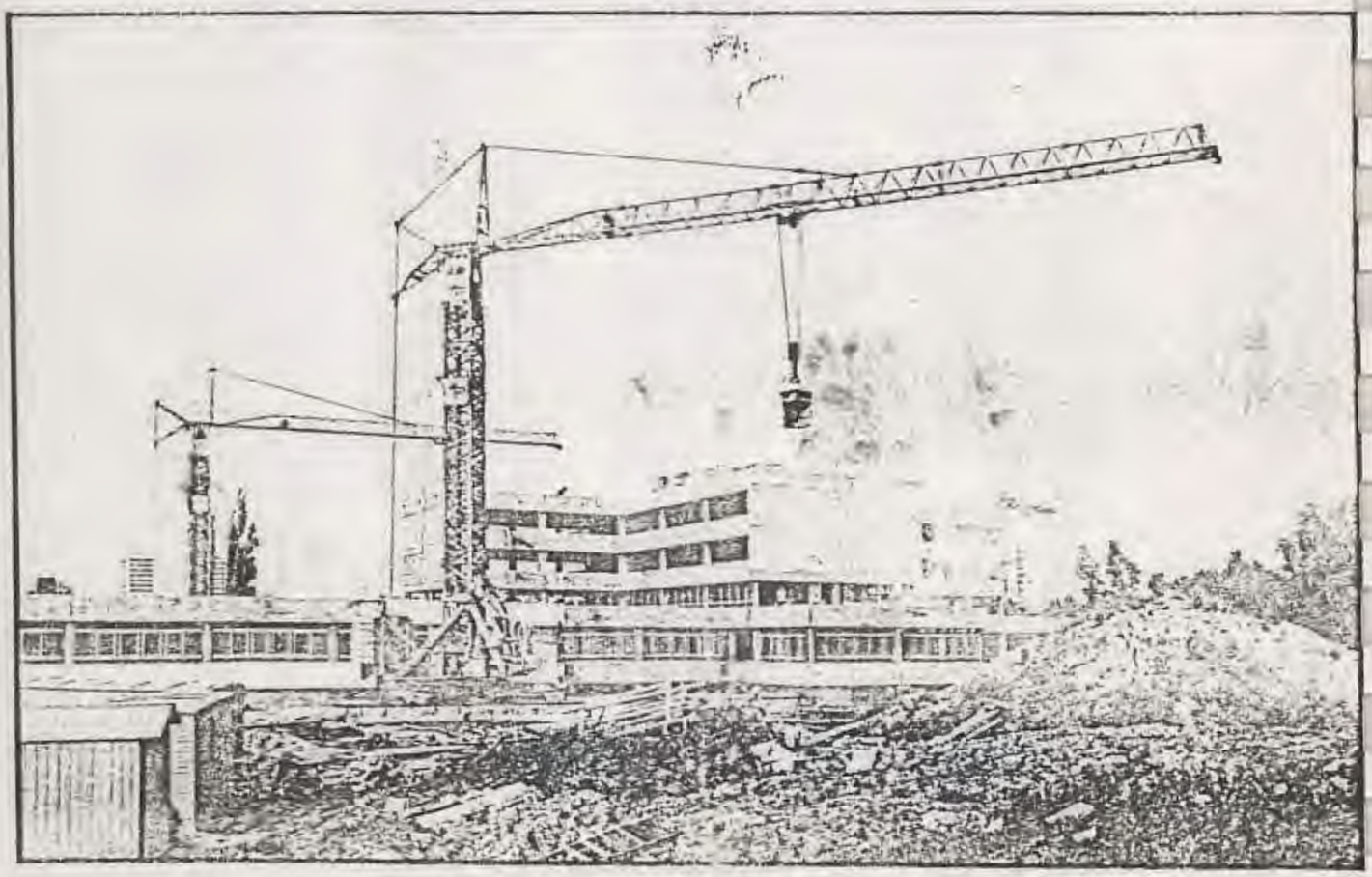


ويتوازن الساعد .

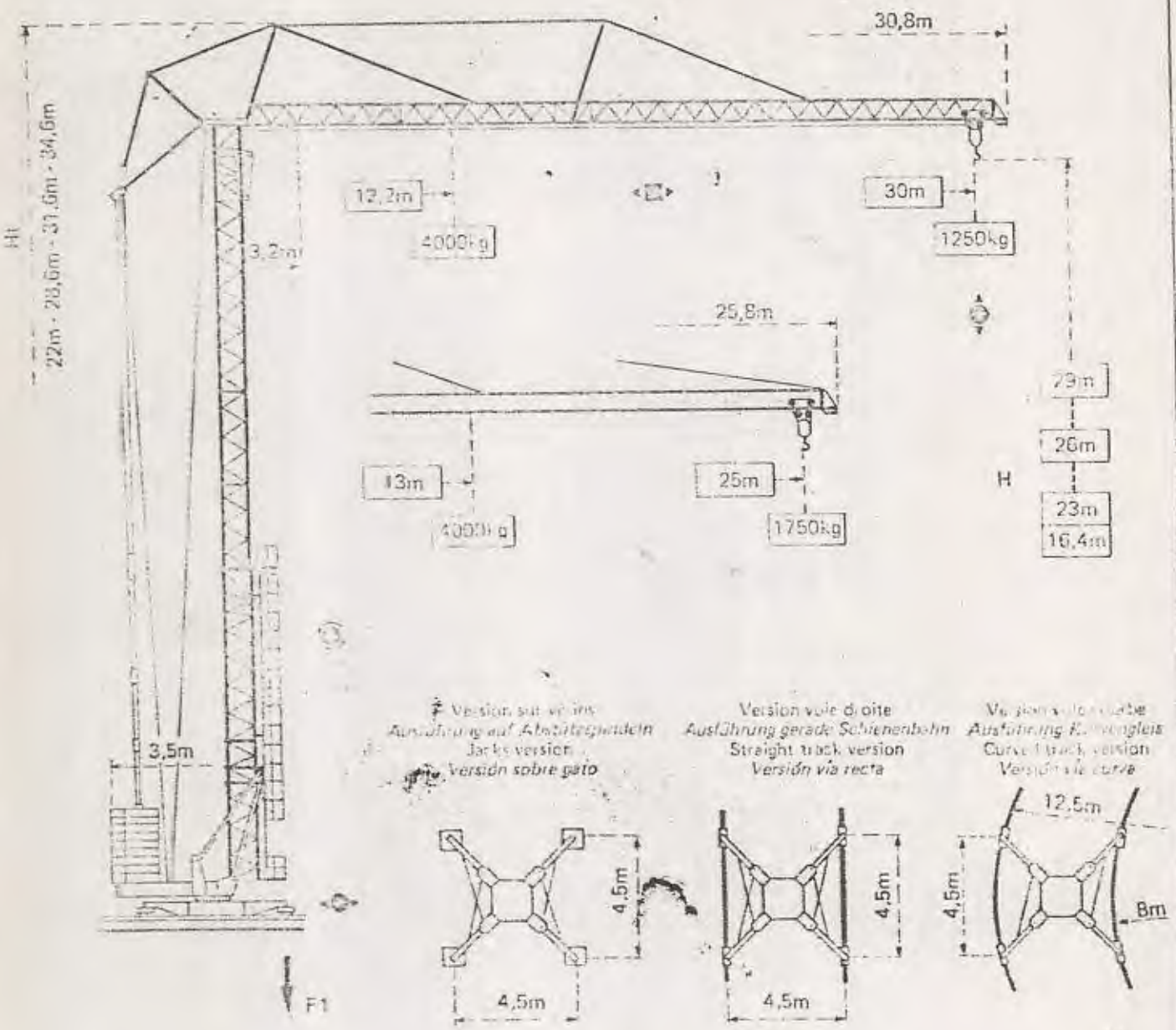
رافعات عالية (عوت) التي يمكن ان تقوم ببناء جسر على طريق رئيسي (اوتوستراد) : ساعد بوضعية الرافعة وذلك لكسب الارتفاع : المزدوجة من ٤٠ الى ١٠٠ طن..



رافعات كبيرة وضخمة اماكنها التي تقوم ببناء مجموعة سكنية : المزدوجة اكبر من ١٠٠ طن .



Cotes *Abmessungen* Dimensions *Dimensiones*



F1 = Réactions *Eddrücke* Reactions *Reacciones*

F1	• 190 kN	▪ 164 kN
	16,7 t	

- En service
- Hors service

A vide sans lest ni train de transport avec flèche et hauteur maximum.

- *In Betrieb*
- *Ausser Betrieb*

Ohne Last, Ballast und Transportachse, mit Maximalausleger und Maximalhöhe.

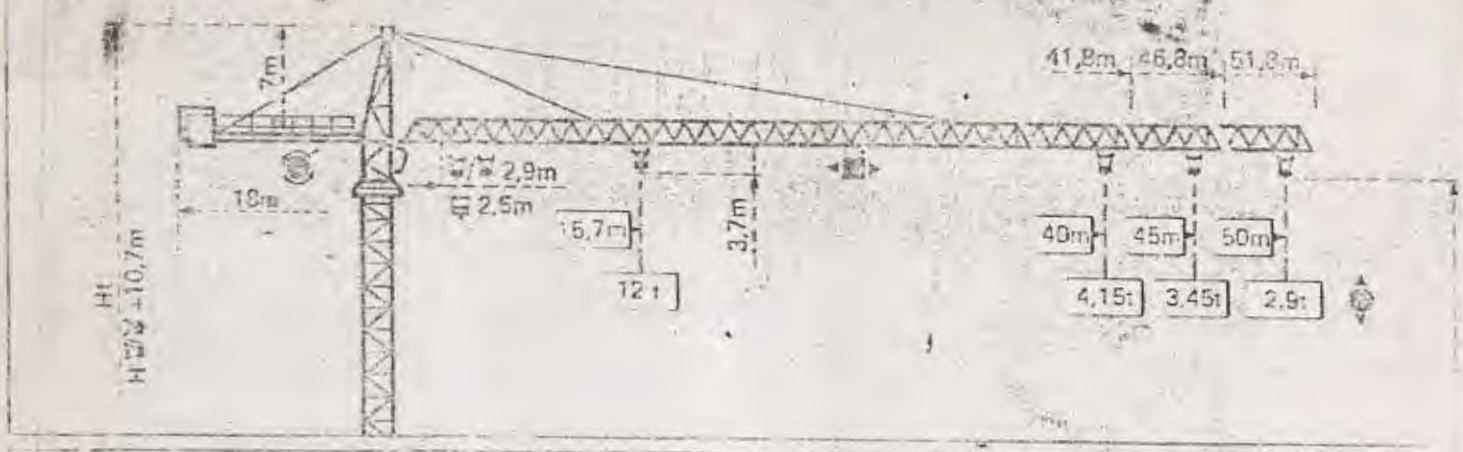
- In service
- Out of service

Without load, ballast or transport axles, with maximum jib and maximum height.

- *En servicio*
- *Fuera de servicio*

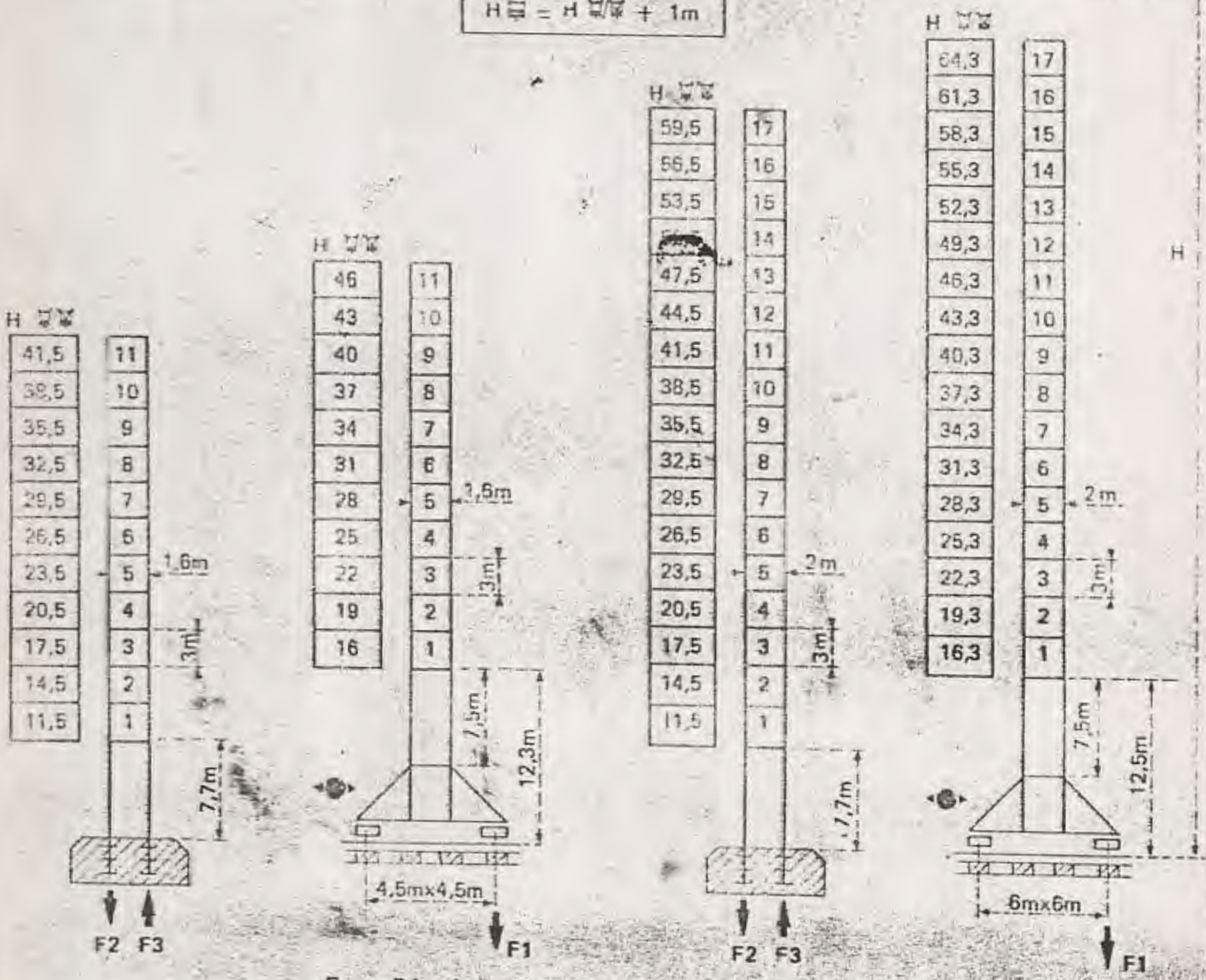
Sin carga, sin lastre, ni tren de transporte, flecha y altura maximas.

Cotes *Abmessungen* Dimensions *Dimensiones*



Mâture *Mast* Mast *Mástil* Ø 1,6m x 1,6m	Mâture *Mast* Mast *Mástil* Ø 2m x 2m
PA 458 / SA 458	PA 664 / VA 664

H ⊠ = H ⊠/⊠ + 1m



F = Réactions *Eckdrücke* Reactions *Reacciones*

F2	● 1120 kN	■ 810 kN
F3	● 700 kN	■ 610 kN
RCS	51,6 t	
LMD	52,6 t	

F1	● 880 kN	■ 700 kN
RCS	60,6 t	
LMD	61,6 t	

F2	● 1160 kN	■ 1770 kN
F3	● 770 kN	■ 1300 kN
RCS	67,2 t	
LMD	68,2 t	

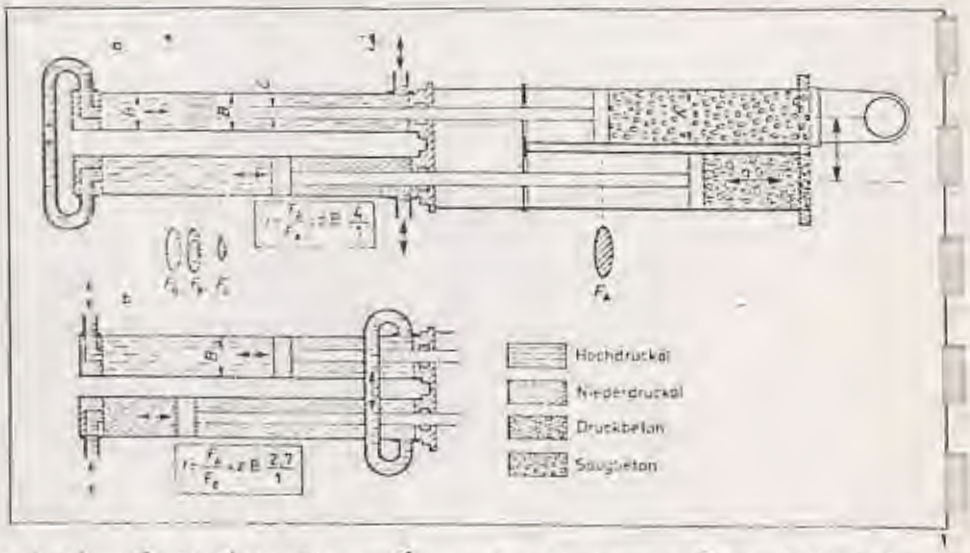
F1	● 880 kN	■ 1210 kN
RCS	81,2 t	
LMD	82,2 t	

Reprint from »Bau + Consulting« Vogel Verlag Würzburg, Edition 1/March 1979

مضخات الخرسانة

من الاصول الهامة في كل موقع بناء

Dipl.-Ing. Karl Schlech



تعاونة محول هيدروليكي بين السلندر الهيدروليكي وسلندر المضخة امكن الحصول على كل الضغط المطلوب : أ - الضغط الخاص بتصليب البستون
ب - الضغط الخاص براس البستون

ان تطور واستخدام مضخات الخراسانة قدم بخطوات واسعة في جمهورية المانيا الاتحادية والان في الامكان الحصول على رؤوس لتغذية ما يزيد على ٢٠٠ متر بدرجة تشغيل عالية بقدرة مع الامان • ولقد حصلت المضخات المستخدمة لتغذية مثل هذه الارتفاعات الغير عادية للعمل تحت ضغوط تصل الى ٢٠٠ ضغط جوي وباستخدام للمواسير الضيقة نحيها فانه في الامكان يكون تغطية مسافات افقية تصل الى ١٠٠٠ مترا واكثر في مواقع العمل الكبيرة • وباستخدام طريقة سد خاصة فان في الامكان علاوة على ذلك نقل المواد العائمة حتى حد ضغوط اعلى •

وتستخدم مضخات الخراسان على نطاق واسع في جمهورية المانيا الاتحادية حيث يوجد هناك طرق مختلفة للضخ — لها ايضا قدرة وقوة مدهشة — قدم تطورها ولا تساعد فقط المضخات الخراسانة على الاقتصاد في الاجر والجهود الانساني بل انها ترفع العبء على اوناش البرج التي تقوم بالرفع وهذا يؤدي الى زيادة اساسية في العمل بالخراسانة وعلى الاخص في حالة ضيق المساحة •

وكما سبق ذكره فان الان في الامكان ضخ الخراسانة الى ارتفاع يصل الى ٢٠٠ متر بدون استخدام مضخات متوسطة للدفع •

رقم عالمي :

ولقد تمثل ذلك في الطريقة التي استخدمت في بناء برج محطة ارسال التليفزيون في مدينة فرانكفورت • (شكل ٥ و ٦) (بجمهورية المانيا الاتحادية) وهو حقيقة فريد في نوعه • فلقد حصلت الخراسانة التي تتراوح حبيباتها بين صفر و ٥ ٣مم الى ٣١٠ متر وهو ارتفاع قياسي عالمي • وهذا يمثل علامة على طريق تطور المضخات ذات المكبس للتعامل مع المخاليط التي تحتوي على كمية كبيرة من المواد الصلبة • وهي المسماه مضخات (المواد الصلبة) وباستخدام اجهزة بنائية لضاغط الضغط الهيدروليكي (شكل ١) بين السلندرات الهيدروليكية وسلندرات المضخة في الامكان انتاج ضغط من هذا النوع والان انه من الممكن بمكان تفريغ هذه الضغوط من على صمام الضخة او صمام اخراج الخراسانة • وتستخدم الضغوط التي تصل الى ١٤٠ ضغط جوي في مشروعات المباني السابق وصفها وتصل الضغوط الثابتة التي يمكن الوصول اليها الى ٨٠ ضغط جوي • وتبلغ كثافة الخراسانة ٢٫٤ كجم / لتر بخلاف الخراسانة مع الماء • وذلك فان الرفع بالضغط تحت الضغط الجوي واحد يخصص لكل اربعة امتار من الارتفاع • وراس التوزيع لاكثر من ٢٠٠ متر دليل على الميزات التي تقدمها طريقة التحميل في المواسير الموضحة في شكل ٢ • واختيار السد داخل صمام الخروج يمكن استبعادها من ذلك بقاطعة جهدا ان اي ترسيب للخراسانة داخل الصمام يمكن علاجها في الحال وذلك بتحميل المواد الى ماسورة اخرى •

الاحكام وانخفاض تكلفة التلف :

لا يزيد التلف بارتفاع الضغط وهذا يعتبر ميزة داخل المواسير خاصة لطريقة تحميل في تصميمات صامات الاخراج التقليدية انها لا تسد بالكامل وبذلك يمكن للخراسانة ان تتسرب الى اماكن كبيرة اذا تعرضت الى ضغوط عالية • وهذه الطريقة تولد ضغوط عالية على السطوح •

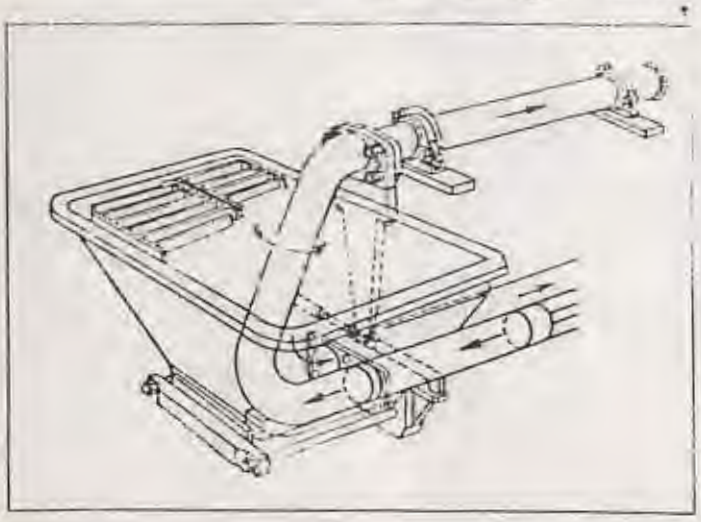
والخراسانة التي تسربت سوف تتصلب وبذلك تسد الفتحة في حين ان الضغط المرتفع على السطح سوف يزيد تلف صمام الاخراج عند كل حركة اثناء الانزلاق •

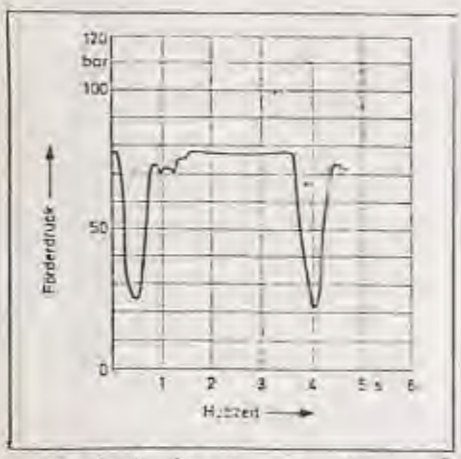
وهذه الظواهر سوف لا تحدث مع استخدام طريقة التحميل داخل المواسير كما هو في شكل ١ وهذه الطريقة المشهورة حتى في حالة التلف البسيط فانه لا يزال في الامكان لهس فقط فقط الخراسانة بل ايضا الماء عند الضغوط القصوى • ويمكن حينئذ ابطال مفعول السد باستخدام ماء من بشتهير السد • وبذلك يكون في الامكان ضخ المخاليط العائمة ثانية على الفضلات الدقيقة الحبيبات وقد دلل ذلك على ميزة خاصة في حالة ضخ المواد الغير متجانسة • ومن جهة اخرى يمكن ان تساعد هذه الطريقة على استخدام مواد تصل حبيباتها الى ٥٠ مم او اكثر •

تصنيع الخراسانة تحت ضغط يصل الى ١٠٠ ضغط جوي :

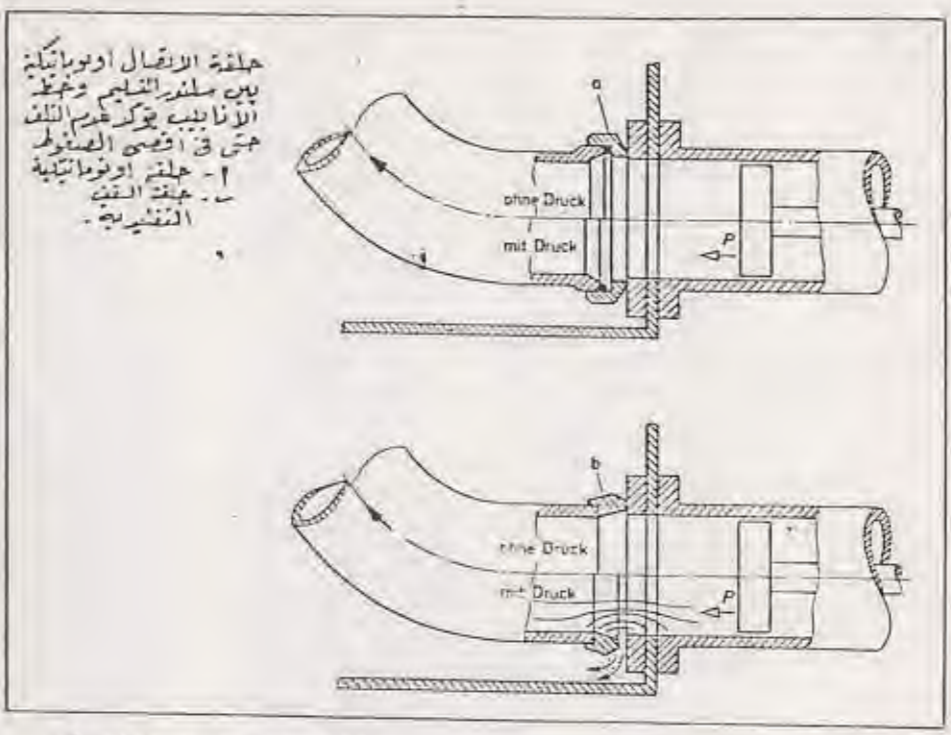
قد اثبتت مضخات الخراسانة كما سبق وصفه فائدتها الاستثنائية في الظروف الغير عادية • ونصف (ايضا العالم)

بستون مزدوج لتصليب الموزعة للضغط المتواصل مع نظام انابيب الزيت سيسمح بعمل بلوكات •





تأثر التسليم بنبيب احيانا فى نغومة الضخ ومواصفاته



حلقة الاتصال اوتوماتيكية بين سلندر التسليم وخط الانابيب تؤكد عدم التلف حتى فى اقصى الضغوط
أ - حلقة اوتوماتيكية
ب - حلقة الثقب التفاضلية .

Putzmeister-Werk,
Maschinenfabrik GmbH,
Echterdinger Strasse 89,
D-7024 Filderstadt 1,
Fed. Rep. of Germany

فى فرانكفورت وقد زودت بقوة كهربائية داخلية تصل الى ١٣٢ كيلووات . يبلغ مشوار الكبس الى ٢١٠٠ مم وقطر السلندرات ما بين ١٥٠ و ١٨٠ و ٢٠٠ و ٢٢٠ مم . وذلك يتوقف على الاعمال التى يجب المبادرة عليها . وهذه هى اقوى الضخات الخراسانية التى تعمل فى اى مكان فى العالم .

يمكن تزويد هذه الضخات من هنا الطراز بمحركات كهربائية او ميكانيكية او بماكينات ديزل وحد المحركات بالطاقة ما بين ١٢٥ و ١٦٠ كيلووات وفى الامكان استعمال محركين كهربائيين للمحافظة على تيار الدائرة عند مستوى منخفض ولقد تم اضافة ماكينات الديزل عادة ما بين ١٠٠ و ١٥٠ كيلووات وتدار الضخة سائرة .

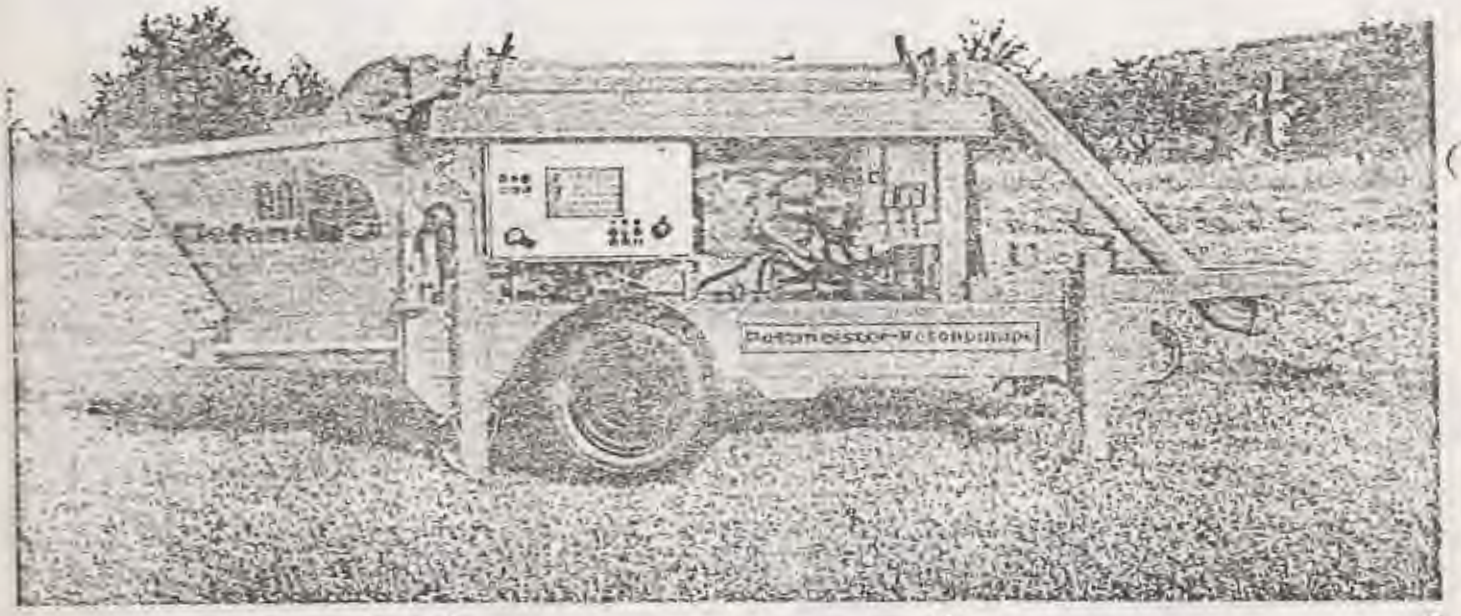
خواص الضخات :

والميزة الخاصة من نمط الطاقة الهيدروليكية (شكل ١) لهذه الضخات هو تخفيض دفعات الضخ بسبب استخدام جهاز ضبط مسجل والتشغيل المدهش الهيدر بالرغم من المشوار الدهور للكبس هو فى الواقع فريد فى نوعه .

وتتعرض الضخة الهيدروليكية اتوماتيكيا لتوليد اقصى ضغط مناسب مثلا اذا اريد دفع مايد الخراسانة داخل المواسير . وبذلك تصل معدل التضخ نسبيا بسبب صعب خواص الضخة بدون ذكر الذروة (شكل ٤) .

Concrete Pumps BA 1000/1400

20



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The trailer concrete pump models of the Economy B-series are constructed with identical units to those used for the truck-mounted pumps of this series. Their compact design makes them especially suitable for use on small building sites and in tunnels.

Standard equipment includes a rigid axle with pneumatic tyres and four adjustable support legs for pumping.

The BA is a high-pressure pump, offering a choice of 1000 or 1400 mm piston stroke, with the rest of the construction details remaining identical. The longer piston stroke is recommended where fewer stroke changes are desired, giving less wear and even smoother delivery.

Further to the standard motor/engine, Diesel engines with up to 118 kw and electric motors up to 75 kw can be used. The hydraulic pumps are flanged on directly and the Diesel engine is suspended elastically in the frame. Electric motors are protected by a PTC-resistor in the motor windings. An oil cooler is standard equipment with all Diesel engines and with electric motors from 55 kw upwards.

The fuel and oil tanks are built into the cover over the machine.

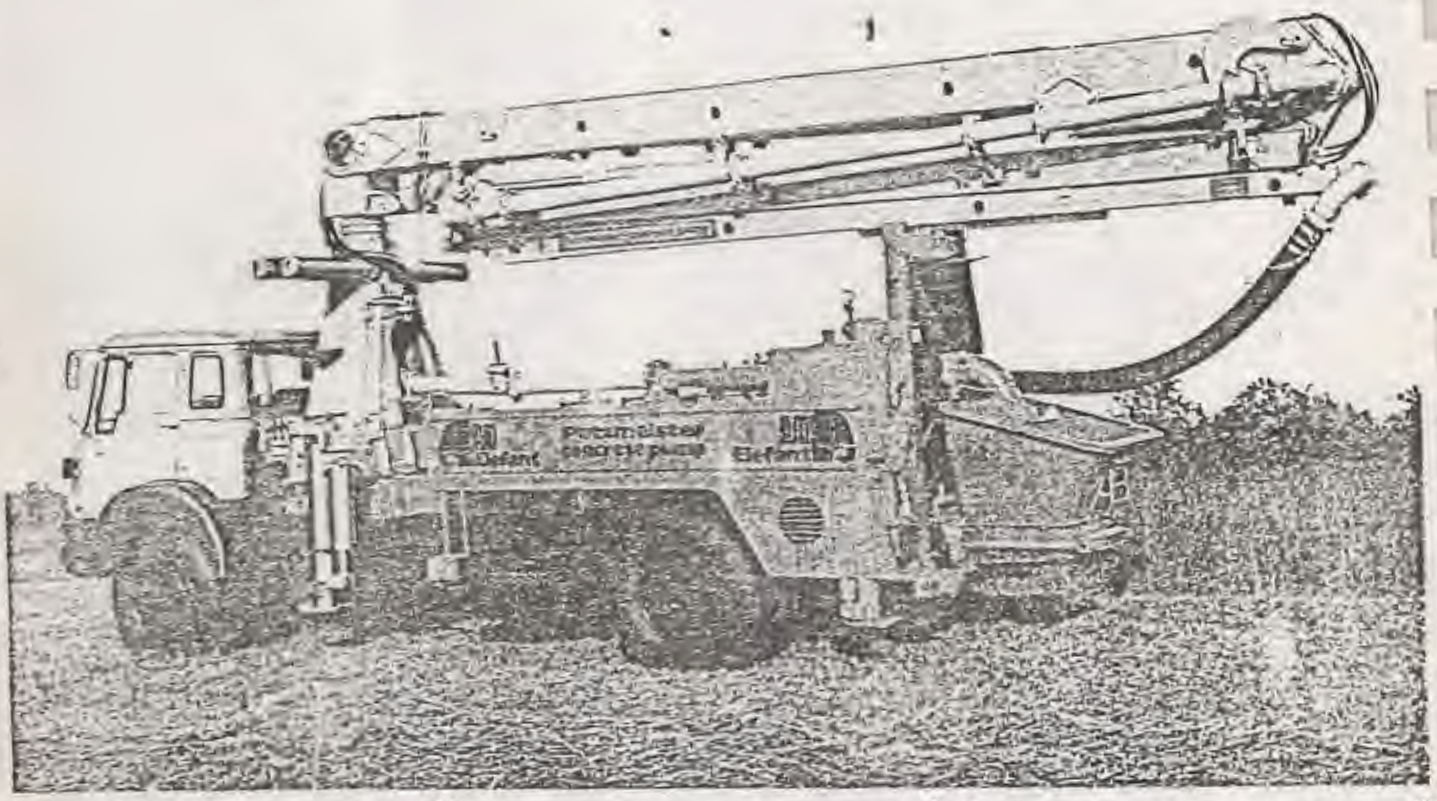
A rubber collar is fitted to the hopper allowing a capacity of up to 700 l ⊙. The discharge outlet ⊗ is closed simply with a piece of rubber belting, which seals perfectly and can be tightened as required. Furthermore no concrete sticks to it.

Optional equipment: air compressor, agitator, high-pressure water spraying pump (30 bar – 150 l/min), lockable side cladding, chassis roadworthy up to 80 km/h (50 mph) and additionally for the 1400 models: central lubrication of the delivery pistons enabling water-free operation in the flushing box when machine is equipped with an oil cooler.

A height of over 200 m was pumped at the Post Office Tower in Frankfurt with a standard BA 1000 HD, 75 kw machine – further to the stationary BRS 2104 Elephant pump normally being used.

Concrete Pumps
BF 1000/1400

24



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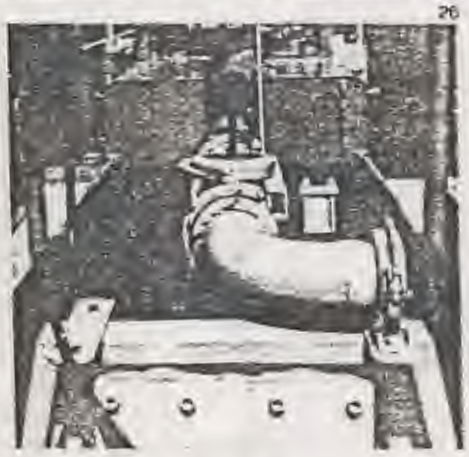


27

The truck-mounted concrete pumps of the Economy series also reach concrete pressures of up to 87 bar and outputs up to 50 m^3/h. Delivery cylinder diameter is 180 mm and a choice of 1000 or 1400 mm piston stroke is offered (BF 1005 HD or BF 1405 HD). Difficult concrete mixes and great distances or heights can be pumped with ease by these powerful pumps.

The low-pressure BF 1006 has hydraulic cylinders with a smaller diameter, producing a higher output (ef. 60 m^3/h).

The truck engine provides an economical drive, normally via a power take-off and flanged-on hydraulic pumps.

The built-in oil pump can transmit up to 150 DIN HP. The usual engine outputs range between 60 and 130 DIN HP. More powerful truck engines (150–190 DIN HP) provide quieter running with decreased engine speed (1800rpm) and stepped-up power take-off gear ratio when ordering).

Output can be adjusted infinitely, with a hand lever ⓢ ⓣ. Pump on/off, reverse pumping and stroke changing can all be regulated by remote control.

The trunk and pressure pipe can be dismounted in a couple of minutes using the concrete placing boom ⓔ.

Oil is cooled by means of the flushing water box and an additional oil cooler on the BF 1400.

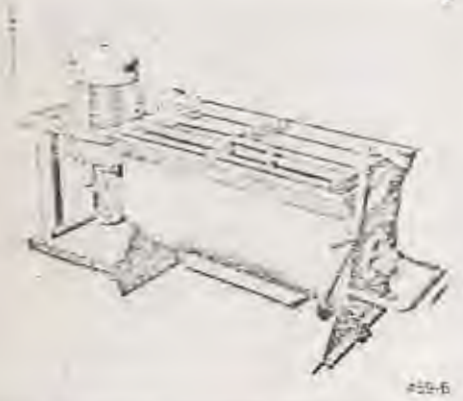
The 500 l water tank ⓢ is equipped with a water spraying pump. The switch box is water proof, with all push buttons and instruments placed for easy control. The operator's stand is especially designed for convenience.

A simple chain lock is supplied for the rear axle ⓡ. For stationary pumping, the pressure pipeline can be mounted on the side of the machine with optional equipment 'side outlet' ⓡ. The BF 1400 can be equipped with central lubrication for the delivery pistons on request.

Many parts are identical and interchangeable with parts used on the heavy BR 1400 and BR 2100 Elephant concrete pump models.

Auch für unterschiedliche Anwendungsbereiche immer die richtige Type zum Pumpen, Spritzen und Injizieren von Feinmörtel.

9



Zwangsmischer Z 80 E zur Ergänzung der P 4 E

Horizontalwellen-Zwangsmischer mit 80 l Fassungsvermögen, angetrieben durch direkt am Schneckengetriebe angeflanschtem 2,2 kW-Elektromotor. Mischerwellendrehzahl ca. 80 U/min. Nach unten öffnende Klappenentleerung.

10

Zwangsmischer Z 80 zur Ergänzung der P 4 S

Horizontalwellen-Zwangsmischer mit 80 l Fassungsvermögen über Keilriemen vom Antriebsmotor der Schneckenpumpe angetrieben. Mischerwellendrehzahl ca. 80 U/min. Nach unten öffnende Klappenentleerung. Halterungen zum nachträglichen Aufbau.

Spritzluftkompressor als Ergänzung zur P 4 S

Einzylinder-Luftkompressor. Liefermenge ca. 300 l/min bei 4 bar, über Keilriemen angetrieben mit entsprechenden Luftarmaturen.

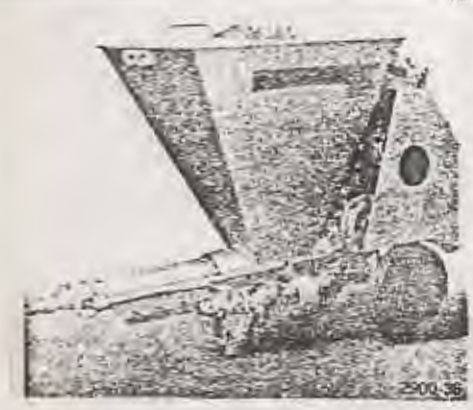
11

Passend dazu:
Zwangsmischer Z 80 mit Keilriemenantrieb (siehe P 4 EE).
Spritzluftkompressor mit Keilriemenantrieb (siehe P 4 EE).

Fahrwerk für P 4 S

Unterlaufbahren für die Ausführungen P 4 SE und P 4 SD. Gefedertes Lauftrahse mit luftbereiften Rädern 5.20-12", Kotflügel und abnehmbare Beleuchtungseinrichtung.

12



Typ P 4 L (Luftantrieb)

Aufbau der Maschine wie P 4 E, jedoch mit direkt am Getriebe angeflanschtem Luftmotor. Leistung 4 kW. Luftbedarf ca. 6 m³/min mit 4 bar für Luftmotor plus ca. 500 l/min Spritzluft. Fördermenge 0,8 bis 12 l/min.

Einsatzbereiche:
Pumpen, Spritzen, Injizieren und Verpressen pumpbarer Medien in explosionsgefährdeter Räumen, z. B. in der Lackindustrie oder im Kohleberg- und Stollenbau.

Material und Aufgabe bestimmen den Typ!

Im Baukastenprinzip läßt sich die P 4 jeder Aufgabe und jedem Material anpassen, z. B.:

Typ P 4 E: das leichte Serienmodell für alle Arbeiten mit naß vorgemischten Fertigmaterialien.

Typ P 4 S mit leistungsstarkem, robustem Antrieb für Mischungen, die im aufgesetzten Zwangsmischer Z 80 hergestellt und mit Druckluft vom aufgebauten Kompressor gespritzt werden sollen. Auf Wunsch straßenfahrbar.

Serienmäßig sind P 4 Maschinen mit einem harten Schneckenmantel, Größe 2 L 4, ausgestattet. Dieser ist für glatte oder gefüllte Mörtel (max. 1 mm Korn) und Drücke bis 25 bar verwendbar.

Für Mörtelzuschlag bis 4 mm Korngröße werden weiche Schneckenmäntel und für lösungsmittelhaltige Materialien „benzolfeste" verwendet.

Welche Maschinen für welche Anwendung?

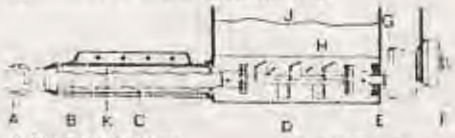
Spachtelmassen, Zementsuspensionen u. ä. gerührt, gespritzt oder gespinkelt mit P 4 E: Im Motor hat ausreichend Kräftereserven. Zubehör: Hochdruckschlauch 25 mm ⌀, Strukturspritzgerät mit Düsen 4, 6, 9 mm ⌀, harter Schneckenmantel, Luftkompressor 600 bis 1000 l/min bauseits.

Mineralische Spritzputze bis 1,5 mm, Haft- und Dampfputze sowie Feuerschutzmörtel sind ideal für P 4 E und P 4 S mit Zierputzspritzgerät und Gummidüsen 10-12, 14 mm ⌀. Nachfertige Trockenmörtel sind ideal für P 4 S mit aufgebautem Mischer und Kompressor. Spritzluftmenge 200-400 l/min ausreichend.

Kunststoffspritzputze und mineralische Spritzputze bis 4 mm Korngröße verarbeitet die P 4 S mit Elektro- oder Dieselmotor und weichem Schneckenmantel.

Sie liefern Trockenmörtel: aufgebauter Zwangsmischer, Schlauchleitung 25 mm ⌀, Zierputzspritzgerät und 1-Zylinder-Luftkompressor ca. 300 l/min aufgebaut.

Systembild Schneckenpumpe P 4:



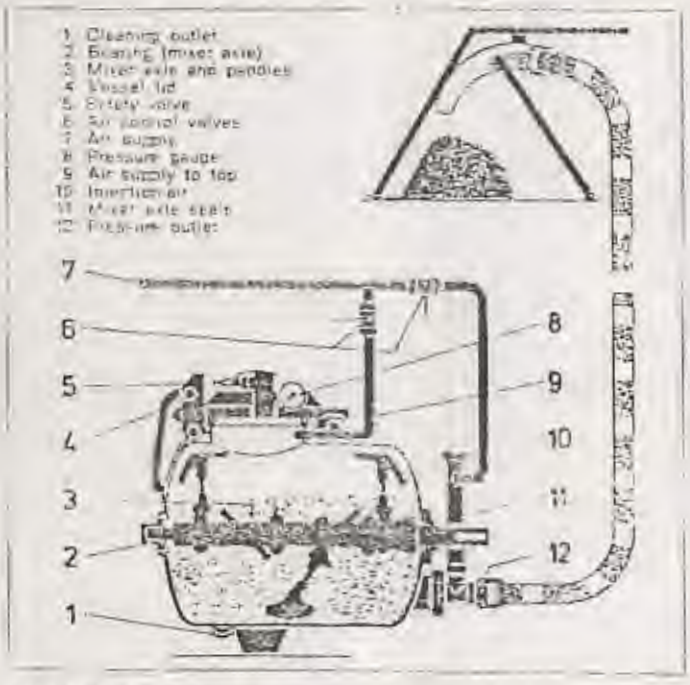
A PM-Schnellkupplung
B Förderschnecke
C nachstellbarer Schneckenmantel
D Gelenkscheibe
E Dichtscheibe
F Schaltkupplung
G Getriebe
H Rührwerk
J Mörteltrichter
K Spannschelle

With MIXOKRET machines you can work without scaffolding; without buckets — using only hoses — quickly, safely, economically. Concrete transported from the dump depot directly up to the floor-screeder! Higher work output — no more equipment problems — better insurance rates — work made easier for the gang — continuous winter operation — higher quality flooring — higher profits for layers and contractors with MIXOKRET.

Apart from floor-screeding, a wide field of applications with mortar and concrete can be covered with PUTZMEISTER MIXOKRET machines.

MIXOKRET machines can deal with mixtures which can no longer be conveyed by known mortar and concrete pumps because they are too lean, too dry or too grainy in structure. Such mixtures with low water-cement factor are, however, often desirable and necessary on account of their high quality. Thus, these new type MIXOKRET machines open up considerable possibilities for every concrete engineer. For example it is now possible with the aid of the MIXOKRET machines to use concretes of sizes 0—8 mm. where previously concrete mixtures of size 0—32 mm. or 0—16 mm. were necessary. As a result of the low water-cement factor the material qualities are practically as good. Delivery is, however, much easier and handier as a result of thin size 50 mm. dia. delivery hoses, and low mechanical outlay.

Concrete conveyance in particular is rationalized and realized in a way considered impossible up to now. Under special conditions MIXOKRET can also be used as a "Wet Spraying Machine" for guniting applications. Alternatively, the MIXOKRET can serve as a simple pressure vessel for front injection, backfilling etc.



MIXOKRET conveyance, simple and positive, provides an even and trouble-free flow of material.

MIXOKRET machines are manufactured in two vessel sizes — 200 and 500 litres. With electric or Diesel drive, built-on compressors and skip loader.

Principle of Operation

MIXOKRET machines mix and convey with only one machine unit. They are, therefore, simple and economical to operate. This is also useful because usually the space available on building sites, in galleries etc. is small. The positive action mixer incorporated in the delivery vessel has spring-mounted mixing paddles. After mixing, the material is evenly fed into the propellent air by the paddles.

Further compressed air is introduced directly into the delivery pipe downstream of the vessel outlet. The result is a smooth, stable flow of material with even very stiff mixtures. The knocking and jumping of the delivery pipe to be feared from previous pneumatic conveyors is a most completely eliminated. The outlet connection is a pipe elbow open at the bottom, which can easily be guided by hand or can take the form of a fixed support. A rubber pot with centrifugal effect can also be used.

The MIXOKRET conveyor system is particularly suitable for conveying damp substances of stiff consistency over long distances. Excessively liquid mixtures are conveyed rather less evenly. In contrast to the well-known pneumatic conveyance used with normal concrete spraying machines, MIXOKRET machines operate with considerably lower air requirement, resulting in much less wear and no segregation at the pipe end, but this is not a fully continuous delivery.

L'autobetoniera fuoristrada.

Off road concrete mixer. • Autobétonnière tous terrains.

From 1600 to 2500 litres of yield concrete capacity.

This is an advanced machine that is able to realize all phases for the preparation and distribution of concrete. With such a vehicle you are the proper dealer for as the time and location in which it is concerned.

- time because the due for prepare the concrete at the time and in the quantity necessary
- location because the machine can be used where the common truck mixer cannot.

The job of the truck mixer Comet is to produce quality concrete that gives the contractor a higher profit.

Rendement:
De 1600 à 2500 litres de béton.

C'est une machine extraordinaire en mesure d'effectuer toutes les phases du cycle de fabrication et de distribution du béton.
Grâce à cette machine vous pouvez disposer d'un origin qui vous sera indépendant quant au temps et à l'endroit d'utilisation:

- le temps, parce que l'entreprise pourra disposer du béton dans les délais et en quantité dont elle a besoin;
- l'endroit, parce que cette machine peut arriver même aux endroits où les bétonnières sur camion ne peuvent arriver.

La fonction des autobétonnières Comet: produire un excellent béton expérimenté par les entrepreneurs de faire de grands profits.

shaft is being produced. In contrast to the vibrator, Model И-116, the exciter of vibrations used in И-116А is of the planetary type with external rotation of the runner.

Surface vibrators. These are used for compacting plain concrete or one-way reinforced concrete floors, vaults, road surfacing, etc., of a thickness not exceeding 25 cm, and concrete components with two-way reinforcement, not more than 12 mm thick.

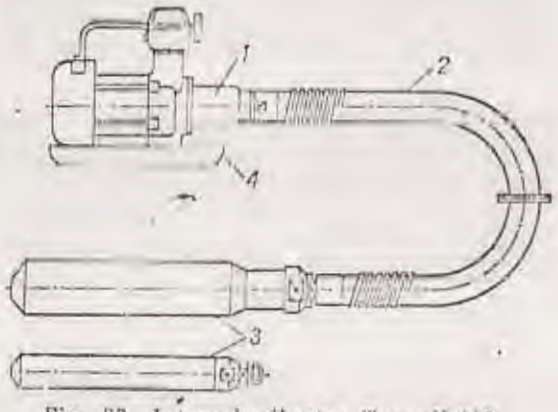


Fig. 83. Internal vibrator Type И-116:
1 — electric motor; 2 — hose with flexible shaft; 3 — changeable working end-parts; 4 — stand

Figure 84 shows the *surface vibrator, Model C-413*, which consists of an operating platform with dimensions 830 × × 430 mm and of a 0.4-kW electric motor placed on the latter. The shaft of the electric motor is equipped with two unbalanced masses, during rotation of which a centrifugal force of inertia not exceeding 400 kg is set up. The vibrations caused by the unbalanced masses are transmitted by the operating platform to the concrete. The productivity of the vibrator is about 5 m³ per hour. Its weight is 40 kg. *Surface vibrator, Model C-414*, is of the same design as C-413, but has an electric motor of twice the power. The vibrator, Model C-414, weighs 41.5 kg.

Both these vibrators receive current of normal frequency, 50 c/s, from a 36-V supply. The transition to low voltage is made in order to reduce the possibility of an electric shock

during work with the vibrator. The vibrator is connected through a step-down transformer, which is supplied by the factory with the vibrator. Switching the vibrator on and off usually takes place by a knife-switch on the distributing

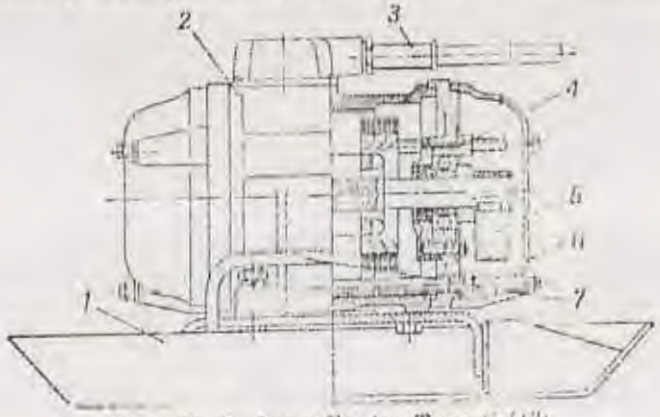


Fig. 84. Surface vibrator Type C-413:
1 — working platform; 2 — electric motor; 3 — electricity supply cable; 4 — ball bearing; 5 — unbalanced mass; 6 — casing; 7 — handle

board. However, the surface vibrator has also separate switches. Usually, one concretor is in charge of the surface vibrator.

Fig. 85. Vibro-screed:
1 — electric motor; 2 — steel bar; 3 — supporting shoe; 4 — removable handle

For compacting concrete paving in road construction the industry supplies a special vibrator, which is called a *vibrating screed* (Fig. 85). This is a metal joist which replaces the operating surface of an ordinary surface vibrator, and which has an electric motor—of the same type as that of vibrator C-413—mounted in the middle. The joist is 400 cm

External or form vibrators. These vibrators are used in the concreting of thin components of monolithic structures, and also in the production of different precast reinforced concrete components.

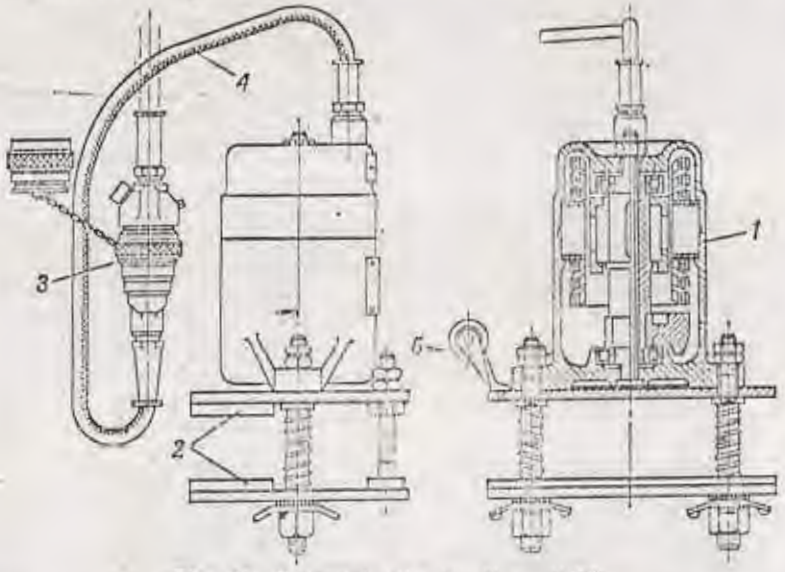


Fig. 87. External vibrator Type II-87:
1 — exciter of vibration; 2 — jaws; 3 — plug connection; 4 — cable; 5 — handle

The most widely used is the *external vibrator, Model II-87* (Fig. 87), which consists of an electric motor with one unbalanced mass on the shaft and clamps for fastening the vibrator to the edge of the form, through which the vibrations are transmitted to the concrete. The distance between the jaws of the vice is from 40 to 80 mm. The external vibrator, Model II-87, is equipped with a 0.45-kW motor which receives current from a 36-V supply. The vibrator weighs 30.5 kg; its productivity is about 2 m^3 of concrete per hour.

The industry at present produces several types of external vibrators with electric motor drive. These are vibrators C-482, C-483, C-484 and C-485, which are used not only for compacting concrete but also for setting in movement granular materials when moving them into hoppers, chutes and

feeders. The distinctive feature of external vibrators of makes C-482, C-483, C-484 and C-485 is that the motor with unbalanced masses has hinged connection with the supporting slab. With this type of connection the vibrator transmits

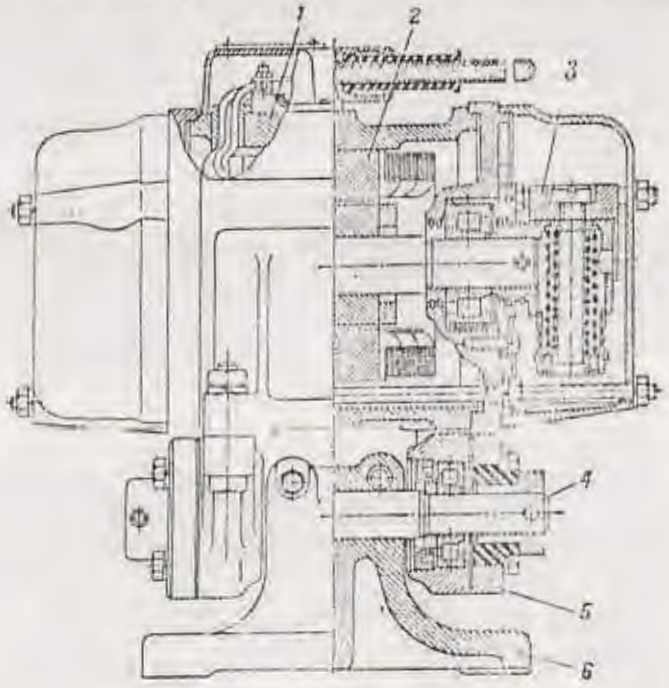


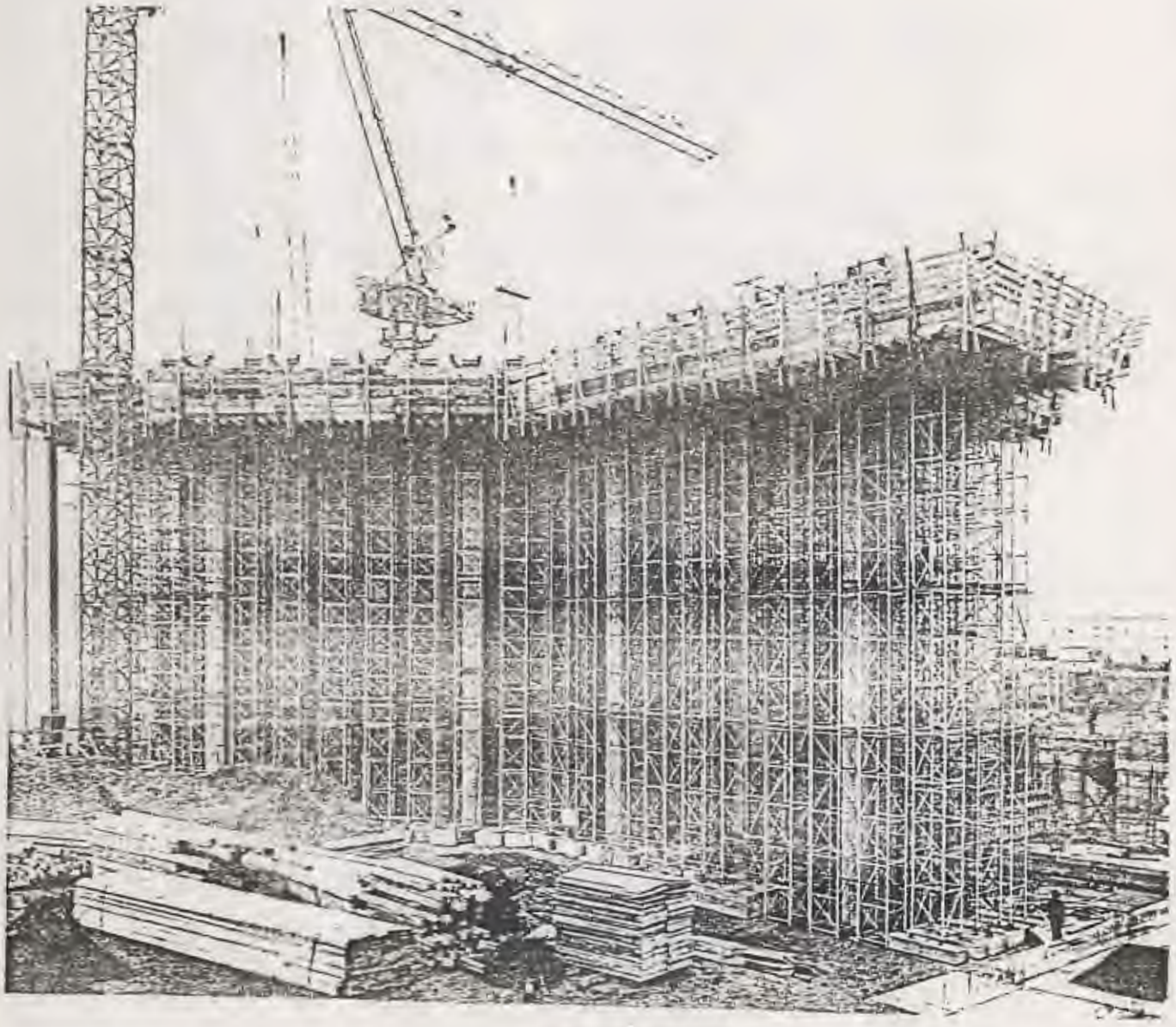
Fig. 88. Pendulum vibrator Type C-482:
1 — casing; 2 — electric motor; 3 — unbalanced mass; 4 — axis of oscillation of vibrator; 5 — shock absorber; 6 — slab serving as support

to the structure directional vibrations even though it has an exciter of vibrations with circular action. The horizontal component of the centrifugal force is not transmitted but sets up oscillation of the motor round the axis of its connection with the supporting slab. Vibrators of this type are called *pendulum vibrators.*

Vibrator C-482 of the pendulum type is shown in Figure 88. It is connected with the supporting slab by the axis

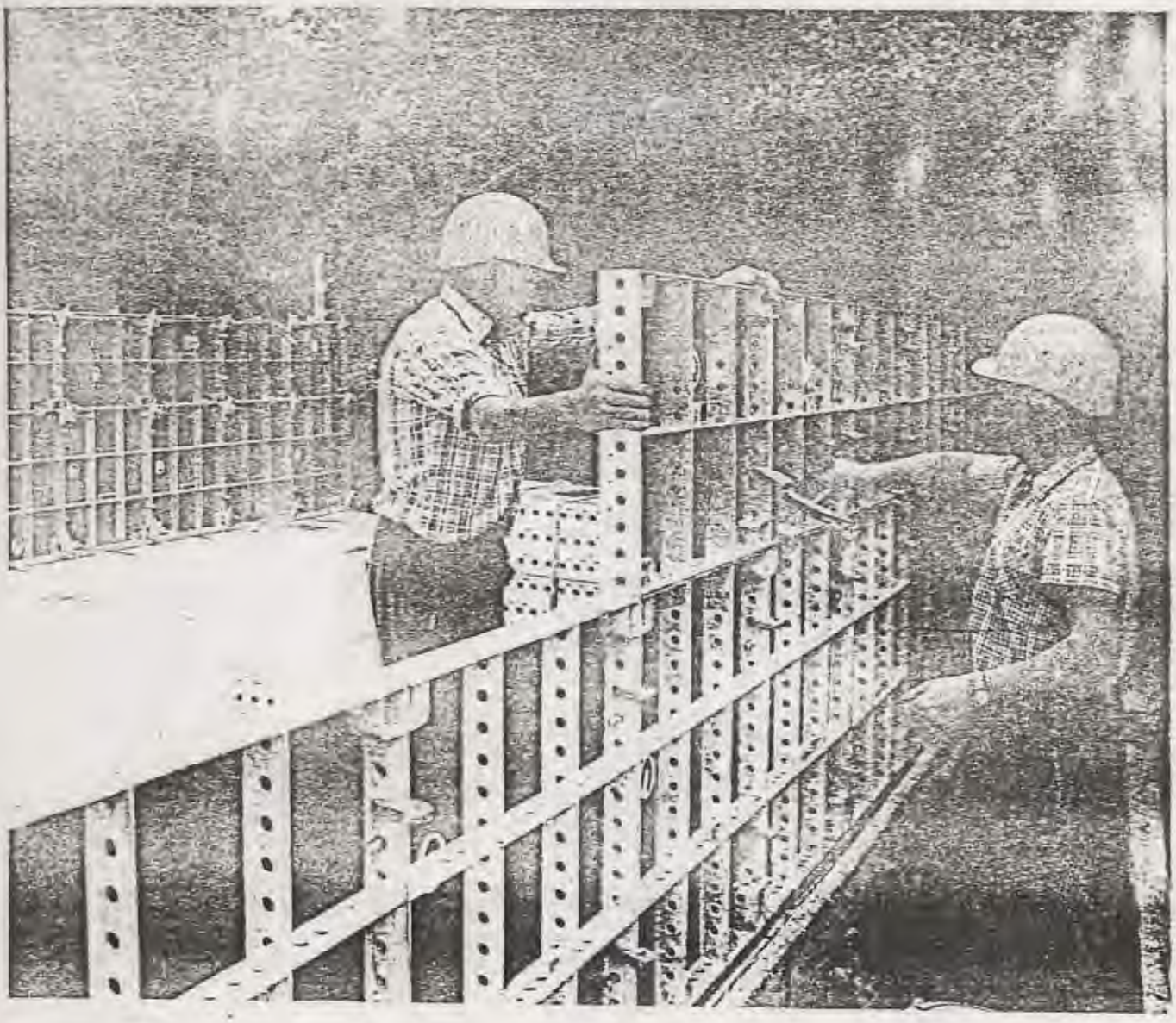
The ID 15-1 frame support

The world's quickest and simplest frame support.



Tekko-Formwork

the universal Tekko Panel System
– Light, handy, completely versatile and hot-dip galvanized –



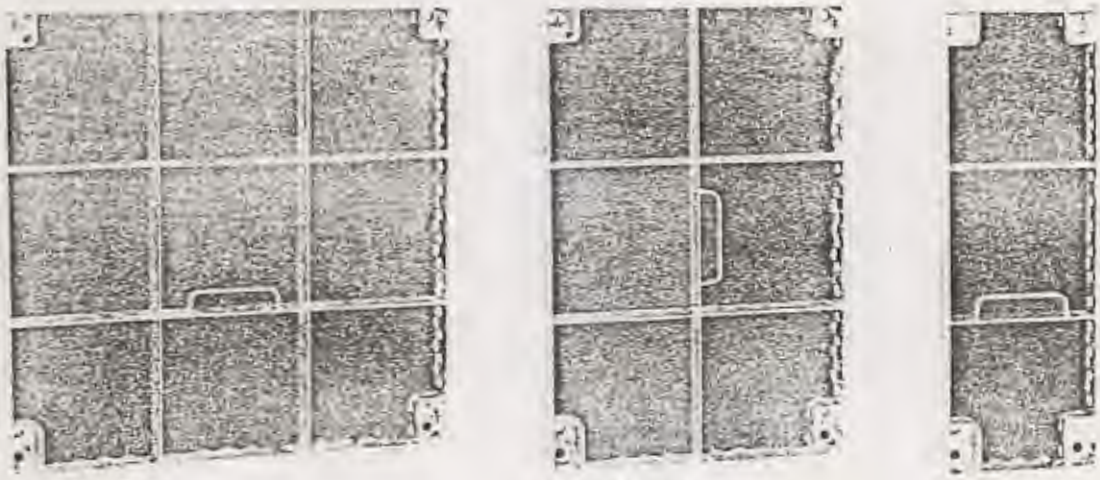
The Panels and their connections.

The Tekko-Panel formwork offers the ultimate in adaptability especially for smaller or unusual type of constructional work. The individual panels are light in weight and easy to handle, so no crane assistance is necessary, and thanks to the basic simplicity of the system, as it consists of only three standard sizes of panels plus connectors, corner pieces and tie rods, any usual type of shuttering work can be undertaken. Its versatility is enhanced even further by a range of accessory items to suit all sites.

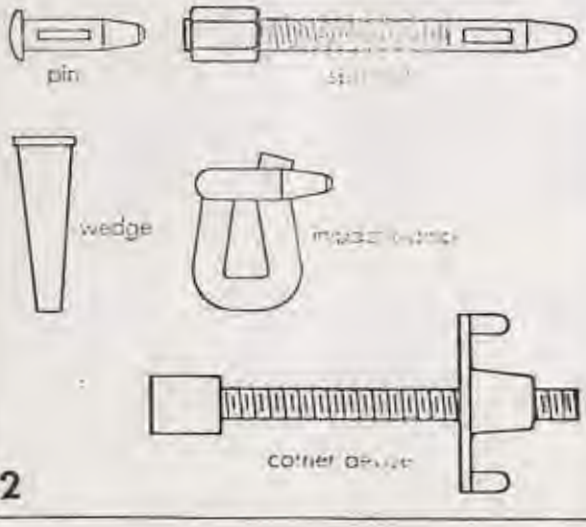
1. The basic size panel is a true square. The two adaptor panels can be fitted either way up, vertically or horizontally, with the basic panel.

2. Panels are locked together either by pins and wedges or by one-piece impact clamps. If a squared timber has to be inserted between two panels for a special length, the connection is similarly carried out using a spanner for variable lengths.

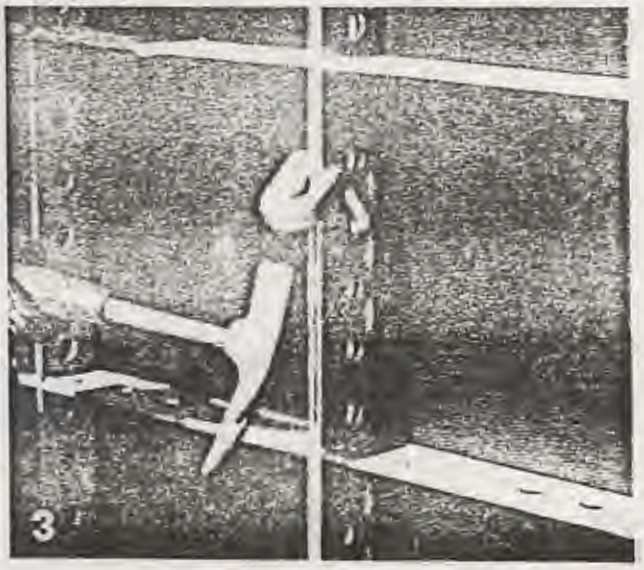
3. The one-piece impact clamps are very simple and easy to use.



1 Panel 90 x 90 Panel 90 x 60 Panel 90 x 30



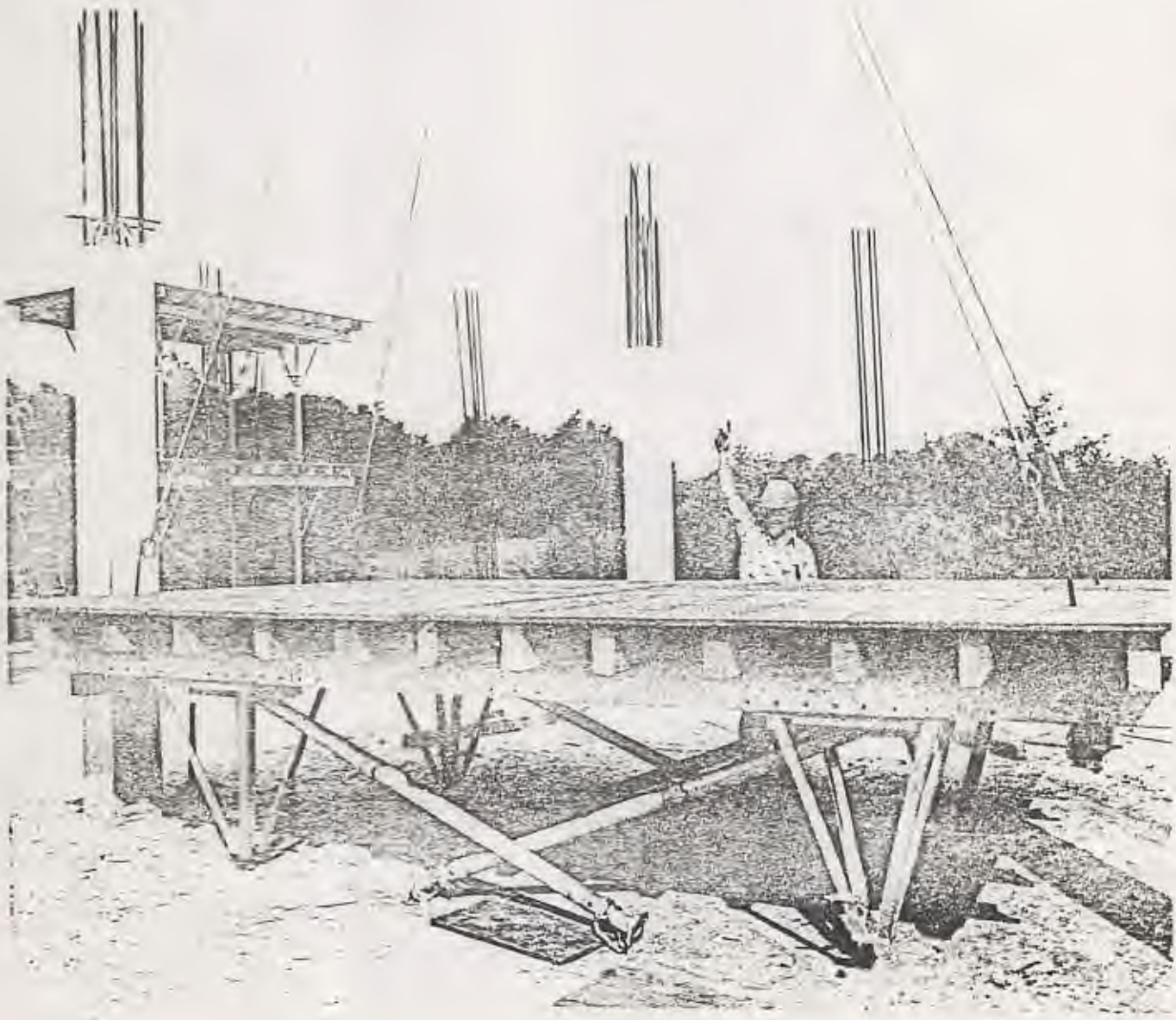
2



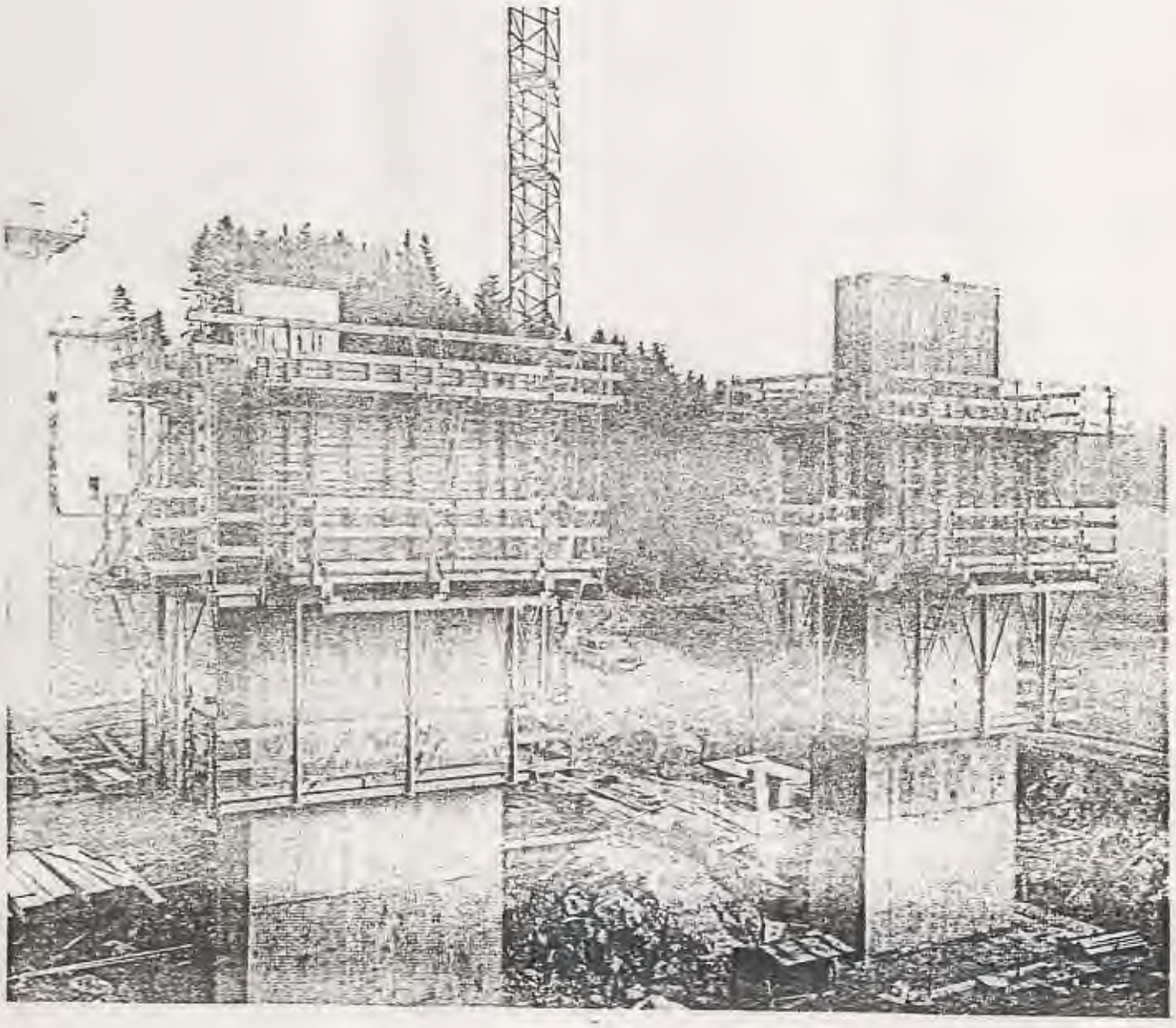
3

The KST-Folding Table Formwork

The foldable table formwork with no cross-bracing



The Climbing Scaffolding and Self Climbing Formwork



The Hünnebeck Self-Climbing Formwork (No crane required)

The Hünnebeck climbing type formwork can be converted into a self-climbing version by supplementing it with an hydraulically powered lifting gear- making thereby independent of any crane-assistance.

Formwork and scaffolding together are thus enabled to climb, as one unit, up vertical or sloping surfaces. The successive lifts may be in steps, chosen at will, between 75 and 100 cm, the inclination of the wall surface to be worked on may be up to ± 30°.

Illustrated here is the complete climbing sequence for a sloping wall, shown step by step.

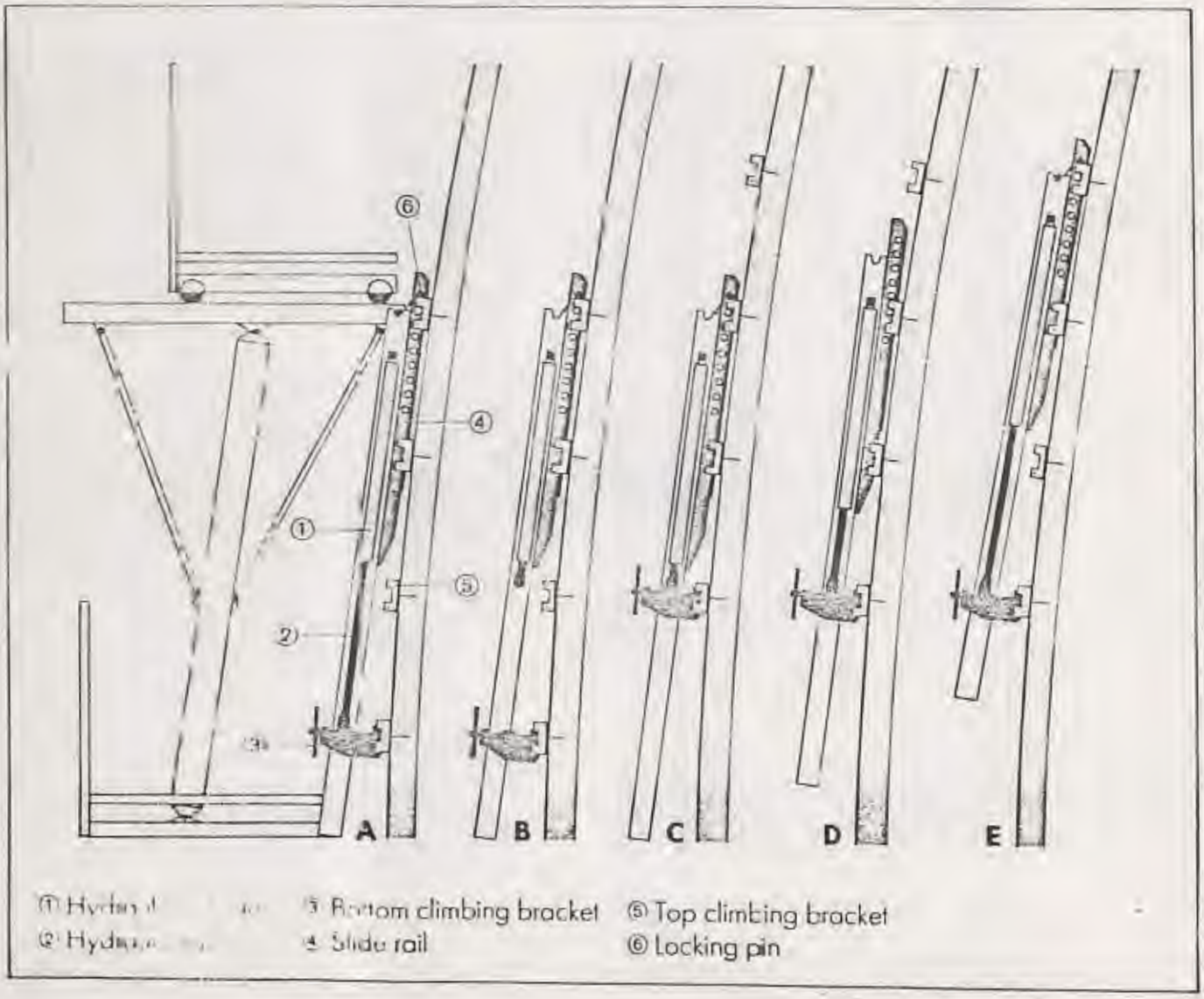
A Climbing scaffolding and lifting gear in the concreting position.
- Hydraulic cylinder with extended hydraulic ram.
- Lifting gear suspended from top climbing bracket. Therefore slide rail is locked in position by locking pin inserted in uppermost hole.
- Slide rail led through two of the climbing brackets.

B Once the wall-formwork has been taken back the ram is retracted into the cylinder.
(To help in following the individual lifting steps the climbing scaffolding itself has been omitted from the diagram).

C Re-positioning the bottom support bracket.
- The lost-used bottom climbing bracket is relocated and fixed up onto the concreted-in tie above at the same time.

D Hydraulic lift-up to next higher climbing bracket.
- Ram connected to climbing bracket
- Locking pin removed
- Ram extended hydraulically

E Lifting-stage completed.
The locking pin is used to secure the lifting gear to the top climbing bracket.



Here then are the salient features of the Hünnebeck Self Climbing Formwork:

1. Type-test results for the complete climbing scaffolding, including tying-in, are available.

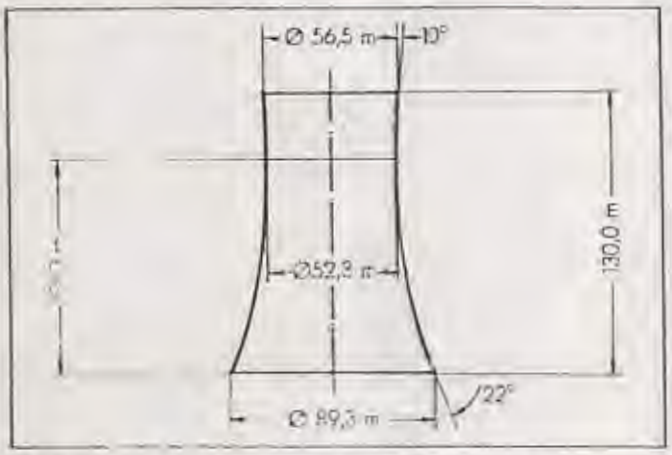
Choice of tie-in system:

a) Tapered one end with end plate on outside concreted surface.

b) Tapered one end with end plate inside concreted surface.

c) Tapered each end.

Concrete quality required: B 15 DIN 1045 Sht. 12.
No restriction on building height.

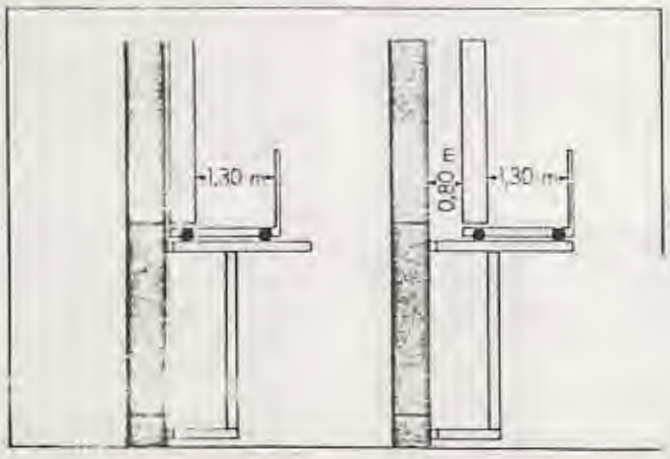


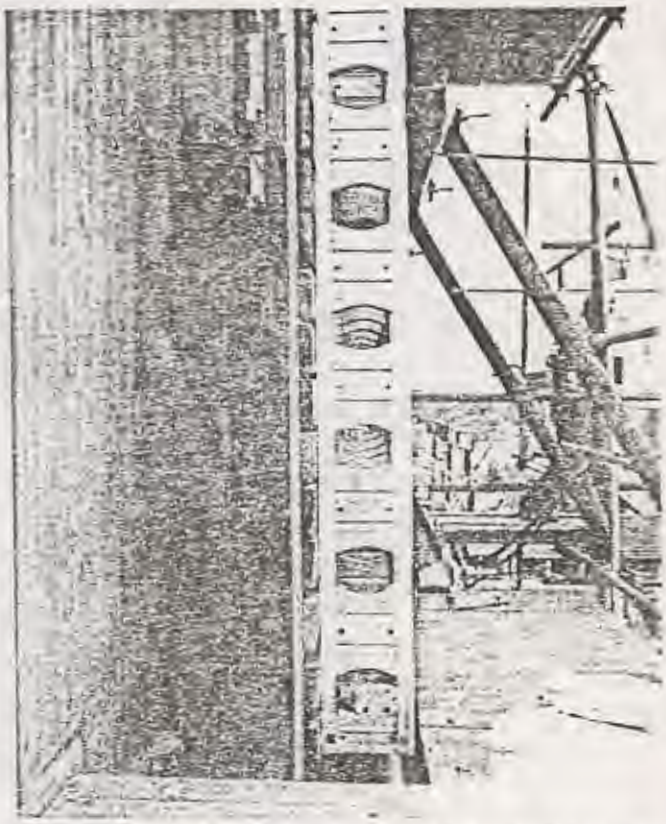
2. Climbs up sloping, curved or vertical surfaces – angle of inclination ± 30°.

3. The guide-rail type of construction for the lifting gear slide ensures absolutely secure attachment of the climbing scaffolding to the building automatically under all conditions of tensile or compressive loading throughout every phase of the lifting and working operation (See p. 3 climbing phase B).

4. The angle of slope of the lifting gear can be altered from lift to lift by adjusting at the bottom support bracket. Varying degrees of slope can therefore be accommodated over the whole workface without difficulty (See p. 3 climbing phase D).

5. The width of the working platform remains the same for all positions of the formwork.





6. The formwork can be run right back. Cleaning down and reinforcing work can therefore proceed with ease, as also any recessing or channelling necessary.

7. Each climbing scaffolding (i.e. dependent lifting gear) can carry exceptionally large areas of formwork e. g. Building height H ≦ 100 m
= up to 14 m² Shuttering area.
H ≧ 100 m
= up to 12 m² Shuttering area.

السيـــــد / المهنـــدس باســـم بطـرس اباد يـر

الاســـــــــم : السيـد المهنـدس/ باسـم بطـرس اباد يـر .

تاريـــخ الميـــــلاد : ٩/١٠/١٩٤٥ .

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* بكالوريوس هندسـة ١٩٦٦ .

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السكـــــــــن : ٥ شارع انجه هانم ـ شبرا

تليفـــــــــون : العمـــل : ٨٠٢٧٢١

المنـــزل : ٦٧٢٣٠١