

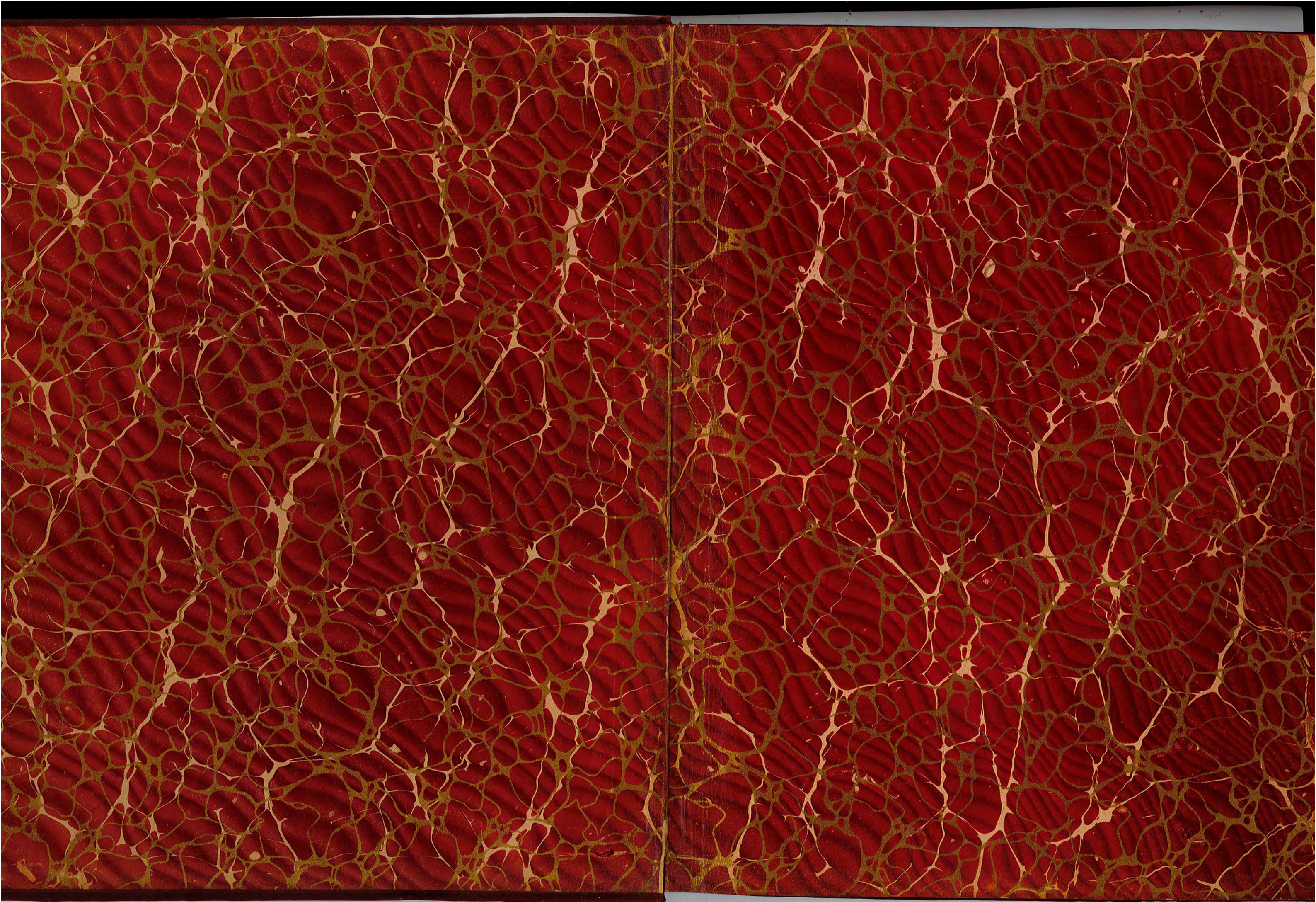
Brickmaking
Machinery

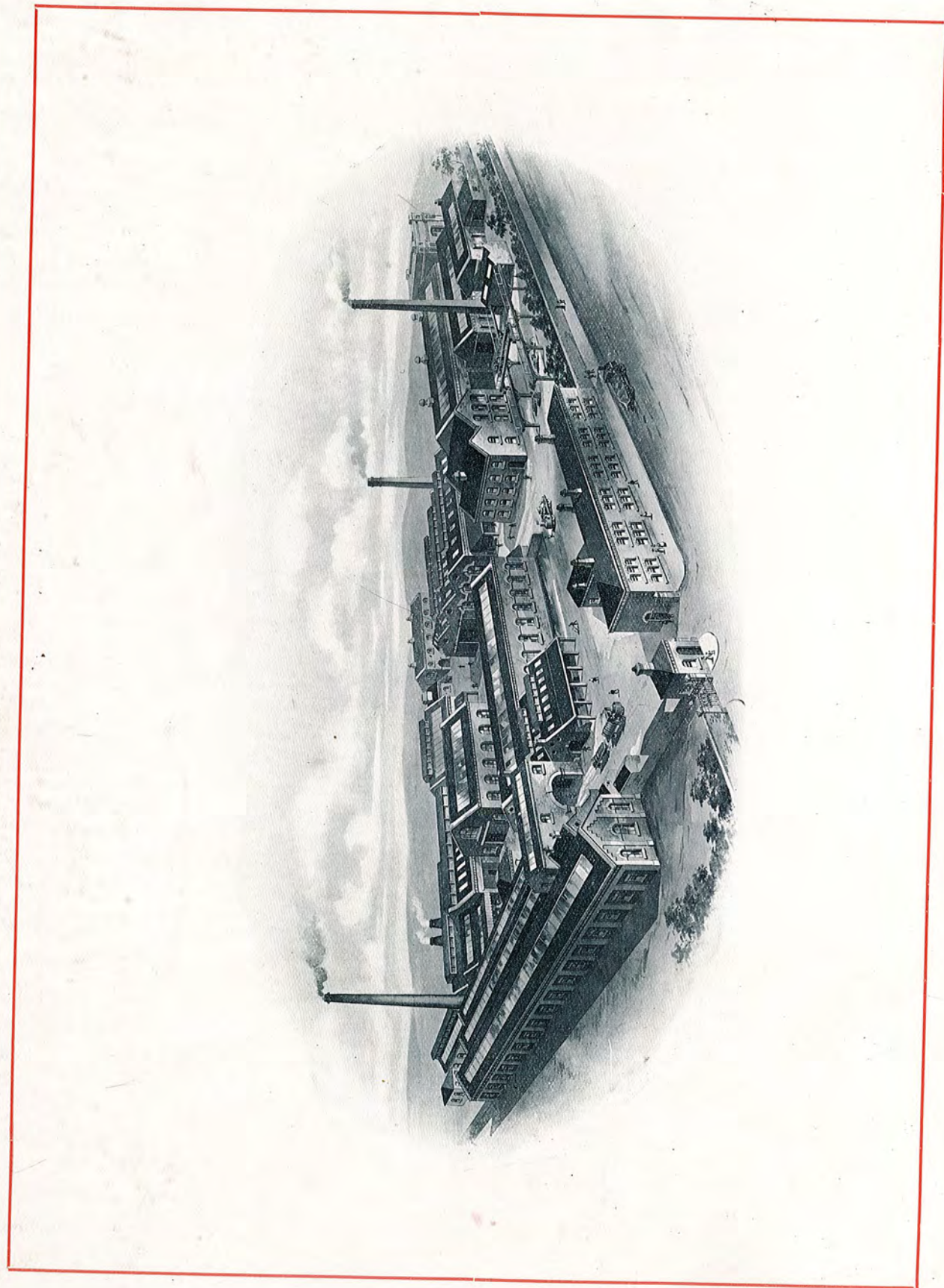
Steam
Engines

etc. _____

Bradley & Craven, Ltd.
Engineers,
Wakefield, England.

8th Edition





Telegraphic Address:
"CRAVEN, WAKEFIELD."
—
TELEPHONE No. 3.

ILLUSTRATED CATALOGUE
of Steam Power BRICK, PIPE and
TILE MAKING MACHINERY,
STEAM ENGINES, &c.

MANUFACTURED BY
BRADLEY & CRAVEN LTD.
Engineers, WAKEFIELD,
England.

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INTRODUCTION.

WE have pleasure in presenting this 8th edition of our Catalogue, which is devoted principally to the illustration and description of Brick Works Machinery, Winding Engines, and Briquette-making Plant, etc., after many years' study and practical experience, and confidently invite attention to the leading features.

In the production of the various machinery, the best materials as well as the highest mechanical skill only are employed, and in design simplicity is aimed at, compatible with strength and durability in working.

We have adopted the latest and best labour-saving machine tools in the different departments, obtaining accuracy, and enabling us to produce a superior class of machinery at a moderate price.

Craven's System of Brick-making has always been identified with economy in production; the bricks being of such density to admit of immediate removal from the Machines to the Kiln; drying sheds and the labour involved being unnecessary.

We were the first makers of Machinery in the country to produce bricks ready for the Kiln.

Grinding Mills. We have the largest and most complete plant in this Country for the production of these powerful Machines, being the Inventors and Original Makers they are adapted for grinding and reducing to dust, fireclays, cement, marls, shales, or dry clay of any description, and are particularly suited for working in conjunction with our Patent Brick-making Machines. Our various types of Mills are of the strongest design, and we claim as their advantages efficiency and durability.

A new feature in these Mills is that the rollers are allowed to swing in arms independently of each other; they can rise and fall as circumstances require; this is a prevention against "chocking" through large pieces of material getting under them.

Brick Presses. A great demand for Presses exists for producing high-class facing bricks, and we have met this by our various types.

We make continuous running presses with automatic feeding motion for working in conjunction with our Brick Machines Nos. 1 and 2; these give large outputs. We have also Presses of similar type fitted with our Improved Roller-key Clutch, suitable for moulded bricks and tiles; these stop automatically at each revolution, enabling the attendant to take off and place in bricks or tiles without danger.

Sanitary Pipe Machinery. We have introduced important improvements of late years in this class of machinery in the shape of balanced Receiving Table and design of Dies. The Machines are very easy to handle and they give a large output of pipes.

Briquetting Machinery. We claim that our CRAVEN'S Patent Briquette Making Machine is the most efficient on the market, and will exert a heavier pressure upon the Briquettes than is possible to obtain by any other. One of the principal features of this Machine is the system of charging the moulds, which expels all air from between the particles of material, ensuring the production of dense briquettes free from laminations. Our Machines have been adopted not only for briquetting coal, but iron and other ores, also blast furnace flue dust.

Winding Engines. The Engines we manufacture include some of the largest in the Country. We build them either simple or compound and with different types of valves, viz.:—Corliss, double beat, piston or balanced slide. All of these valve gears are fitted with improved cut-off motion effecting great economy in steam. We also attach to to Engines of this class the "Perfex" Patent Controller and Speed Regulator, rendering over-winding an impossibility.

Winding Drums we make either cylindrical or conical, and our facilities in this department are for drums to 30 ft. diameter.

Hauling Engines and Friction Clutches. We make these of the self-contained type, on steel girders or cast-iron frames and fitted with Corliss or Slide Valves; the gearing may be of the machine-cut or moulded double helical (cast iron or steel), or straight spur, as preferred. The friction clutches are of our improved expanding ring type, special attention being paid to the hardness of the metal of the inner and outer friction rings to ensure durability in wear.

BRADLEY & CRAVEN, LTD.

PRICE LIST.

£ s. d.

CRAVEN'S Patent No. 1 BRICK-MAKING AND PRESSING MACHINE (as illustrated on pages 10 and 10a), with Single Shaft Mixer				...	...	...
Extra for additional Mixer				...	...	...
Packing and delivery, f.o.b., London				...	...	...
Do. do. Liverpool				...	...	...
CRAVEN'S Patent No. 2 BRICK-MAKING AND PRESSING MACHINE (as illustrated on page 12) with Twin Shaft Mixer				...	...	...
Extra for additional Mixer				...	...	...
Packing and delivery, f.o.b., London				...	...	...
Do. do. Liverpool				...	...	...
CRAVEN'S Patent No. 2 BRICK-MAKING AND PRESSING MACHINE with Twin Shaft Mixer (as illustrated on page 12a) with RE-PRESS COMBINED				...	...	...
Extra for additional Mixer				...	...	...
Packing and delivery, f.o.b., London				...	...	...
Do. do. Liverpool				...	...	...
CRAVEN'S Patent No. 4 BRICK-MAKING MACHINE (as illustrated on page 14) with Single Shaft Mixer				...	...	...
Packing and delivery, f.o.b., London				...	...	...
Do. do. Liverpool				...	...	...
PLASTIC CLAY BRICK-MAKING MACHINE (as illustrated on page 16), Pug Mill 14in. diam. with one pair of rollers				...	...	...
Packing and delivery, f.o.b., London				...	...	...
Do. do. Liverpool				...	...	...
DITTO, 19in. diam. Pug Mill, with one pair of Rollers				...	...	...
Packing and delivery, f.o.b., London				...	...	...
Do. do. Liverpool				...	...	...
DITTO, 24in. diam. Pug Mill, with one pair of Rollers				...	...	...
Packing and delivery, f.o.b., London				...	...	...
Do. do. Liverpool				...	...	...
DITTO, 14in. Pug Mill, with two pairs Rollers (as illustrated on page 18)				...	...	...
Packing and delivery, f.o.b., London				...	...	...
Do. do. Liverpool				...	...	...
DITTO, 19in. Pug Mill, with two pairs Rollers				...	...	...
Packing and delivery, f.o.b., London				...	...	...
Do. do. Liverpool				...	...	...
DITTO, 24in. Pug Mill, with two pairs Rollers				...	...	...
Packing and delivery, f.o.b., London				...	...	...
Do. do. Liverpool				...	...	...

				£ s. d.		
7ft. diam. SLUDGE PAN AND PUG MILL (as illustrated on page 20)	...	...	...	...	...	...
Packing and delivery, f.o.b., London	...	...	...	...	...	...
Do. do. Liverpool	...	...	...	...	...	...
10ft. diam. PERFORATED REVOLVING CLAY MILL (over-driven "open base" type as illustrated on page 22)	...	...	...	...	...	...
Packing and delivery, f.o.b., London	...	...	...	...	...	...
Do. do. Liverpool	...	...	...	...	...	...
9ft. diam. DITTO DITTO ("open base" or "dish" types as illustrated on pages 22, 24 and 26)	...	...	...	...	...	...
Packing and delivery, f.o.b., London	...	...	...	...	...	...
Do. do. Liverpool	...	...	...	...	...	...
7ft. diam. DITTO DITTO	...	...	...	...	...	...
Packing and delivery, f.o.b., London	...	...	...	...	...	...
Do. do. Liverpool	...	...	...	...	...	...
ELEVATORS, for conveying Clay for 10ft. Mill	...	...	...	...	...	...
Packing and delivery f.o.b., London	...	...	...	...	...	...
Do. do. Liverpool	...	...	...	...	...	...
DITTO ditto ditto 9ft. Mill	...	...	...	...	...	...
Packing and delivery, f.o.b., London	...	...	...	...	...	...
Do. do. Liverpool	...	...	...	...	...	...
DITTO ditto ditto 7ft. Mill	...	...	...	...	...	...
Packing and delivery f.o.b., London	...	...	...	...	...	...
Do. do. Liverpool	...	...	...	...	...	...
9ft. diam. WET or PLASTIC CLAY-GRINDING MILL (as illustrated on page 28)	...	...	...	...	...	...
Packing and delivery f.o.b., London	...	...	...	...	...	...
Do. do. Liverpool	...	...	...	...	...	...
7ft. diam. WET or PLASTIC CLAY-GRINDING MILL	...	...	...	...	...	...
Packing and delivery, London	...	...	...	...	...	...
Do. do. Liverpool	...	...	...	...	...	...
HORIZONTAL CLAY-CRUSHING ROLLERS, (single pair), (as illustrated on page 30) 24in. diam. by 29½in. wide	...	...	...	...	...	...
Packing and delivery, f.o.b., London	...	...	...	...	...	...
Do. do. Liverpool	...	...	...	...	...	...
DITTO. DITTO. ROLLERS 20ins. diam. by 20ins. wide	...	...	...	...	...	...
Packing and delivery, f.o.b., London	...	...	...	...	...	...
Do. do. Liverpool	...	...	...	...	...	...

				£ s. d.		
DOUBLE CLAY-CRUSHING ROLLERS, 30in. diam. with Elevators (as illustrated on page 32) (If without Elevators £30 less)	...	...	...	...	...	...
Packing and delivery, f.o.b., London	...	...	...	...	...	...
Do. do. Liverpool	...	...	...	...	...	...
CRAVEN'S PATENT POWER BRICK AND TILE PRESS (as illustrated on page 34), with variable speed of crosshead, and automatic feed motion	...	...	...	...	...	...
Packing and delivery, f.o.b., London	...	...	...	...	...	...
Do. do. Liverpool	...	...	...	...	...	...
CRAVEN'S PATENT POWER BRICK AND TILE PRESS, with automatic stopping motion and variable speed crosshead (as illustrated on page 36)	...	...	...	...	...	...
Packing and delivery, f.o.b., London	...	...	...	...	...	...
Do. do. Liverpool	...	...	...	...	...	...
CRAVEN'S PATENT POWER DOUBLE BRICK PRESS (as illustrated on page 38)	...	...	...	...	...	...
Packing and delivery, f.o.b., London	...	...	...	...	...	...
Do. do. Liverpool	...	...	...	...	...	...
CRAVEN'S PATENT TILE AND QUARRY PRESS (as illustrated on page 40)	...	...	...	...	...	...
Packing and delivery, f.o.b., London	...	...	...	...	...	...
Do. do. Liverpool	...	...	...	...	...	...
HAND-SCREW BRICK AND TILE PRESS (as illustrated on page 42)	...	...	...	...	...	...
Packing and delivery, f.o.b., London	...	...	...	...	...	...
Do. do. Liverpool	...	...	...	...	...	...
CRAVEN'S PATENT CARBIDE PRESS (SINGLE DIE) (as illustrated on page 44)...	...	...	...	...	...	...
Packing and delivery, f.o.b., London	...	...	...	...	...	...
Do. do. Liverpool	...	...	...	...	...	...
DITTO. (DOUBLE DIE) (as illustrated on page 46)	...	...	...	...	...	...
Packing and delivery, f.o.b., London	...	...	...	...	...	...
Do. do. Liverpool	...	...	...	...	...	...
9ft. diam. MORTAR MILL with ENGINE combined (as illustrated on page 48)	...	...	...	...	...	...
Packing and delivery, f.o.b., London	...	...	...	...	...	...
Do. do. Liverpool	...	...	...	...	...	...
8ft. diam. MORTAR MILL with ENGINE combined	...	...	...	...	...	...
Packing and delivery, f.o.b., London	...	...	...	...	...	...
Do. do. Liverpool	...	...	...	...	...	...
7ft. diam. MORTAR MILL with ENGINE combined	...	...	...	...	...	...
Packing and delivery, f.o.b., London	...	...	...	...	...	...
Do. do. Liverpool	...	...	...	...	...	...

£ s. d.

ENDLESS CHAIN HAULING GEAR with ONE WROT. IRON WAGON	
TIPPLER (as illustrated on page 52), exclusive of chain ...	...
Packing and delivery, f.o.b , London ...	...
Do. do. Liverpool ...	...

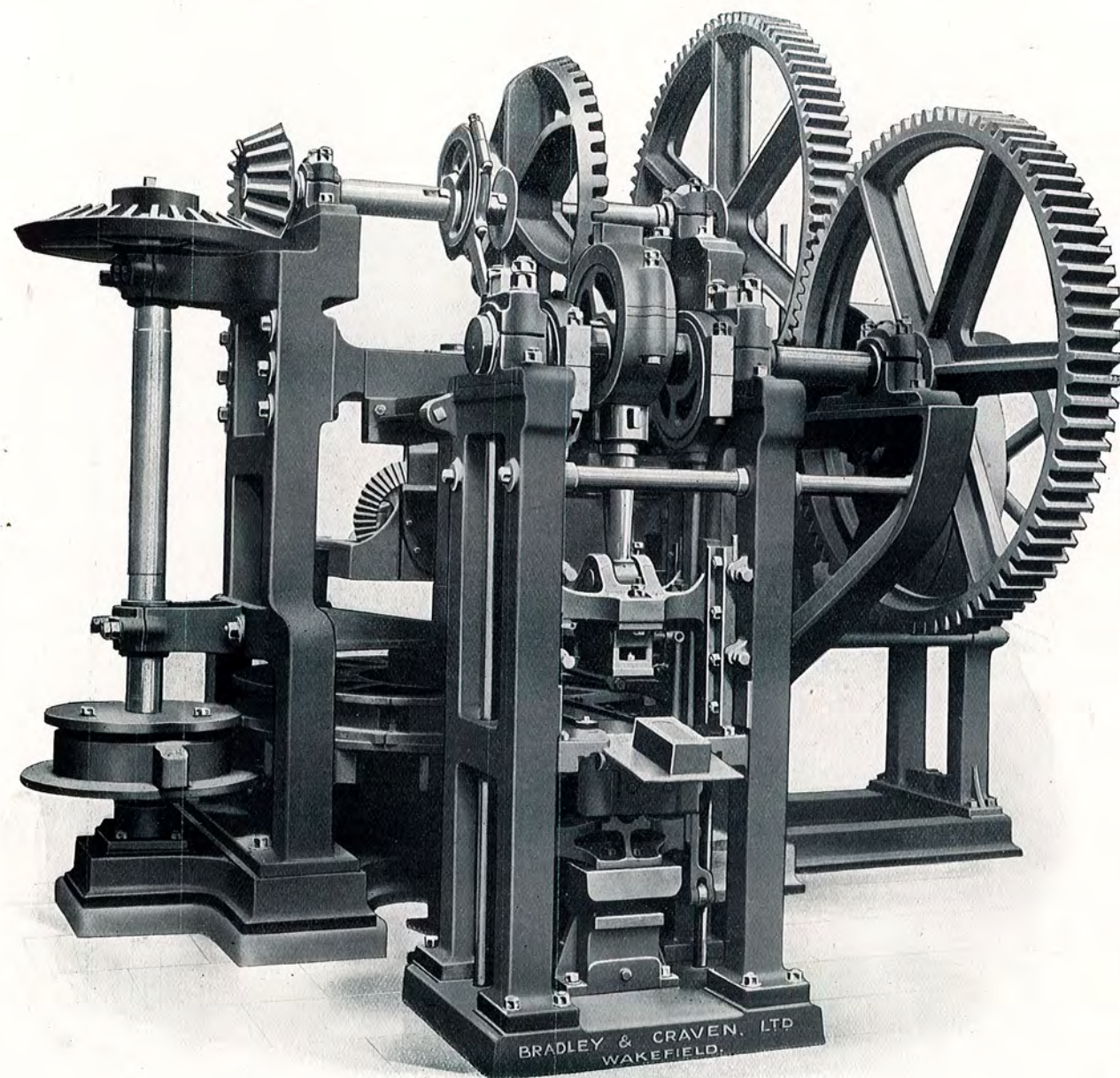
MILD STEEL CLAY TRUCKS with flanged ends				
(as illustrated on page 54)	...	...	..	... each
Delivery, f.o.b., London or Liverpool			...	... each

PATENT BRIQUETTE MACHINE—CRAVEN'S PATENT SYSTEM (as illustrated on page 58).

	£		£ s. d.		£ s. d.
3ft. 6in. diam.	...	;	Packing and delivery, London	...	;
4ft. 0in.	...	;	" " "	...	;
4ft. 6in.	...	;	" " "	...	;
5ft. 0in.	...	;	" " "	...	;

PRICES AND SPECIFICATIONS ON APPLICATION.

Brick=Making Machines.



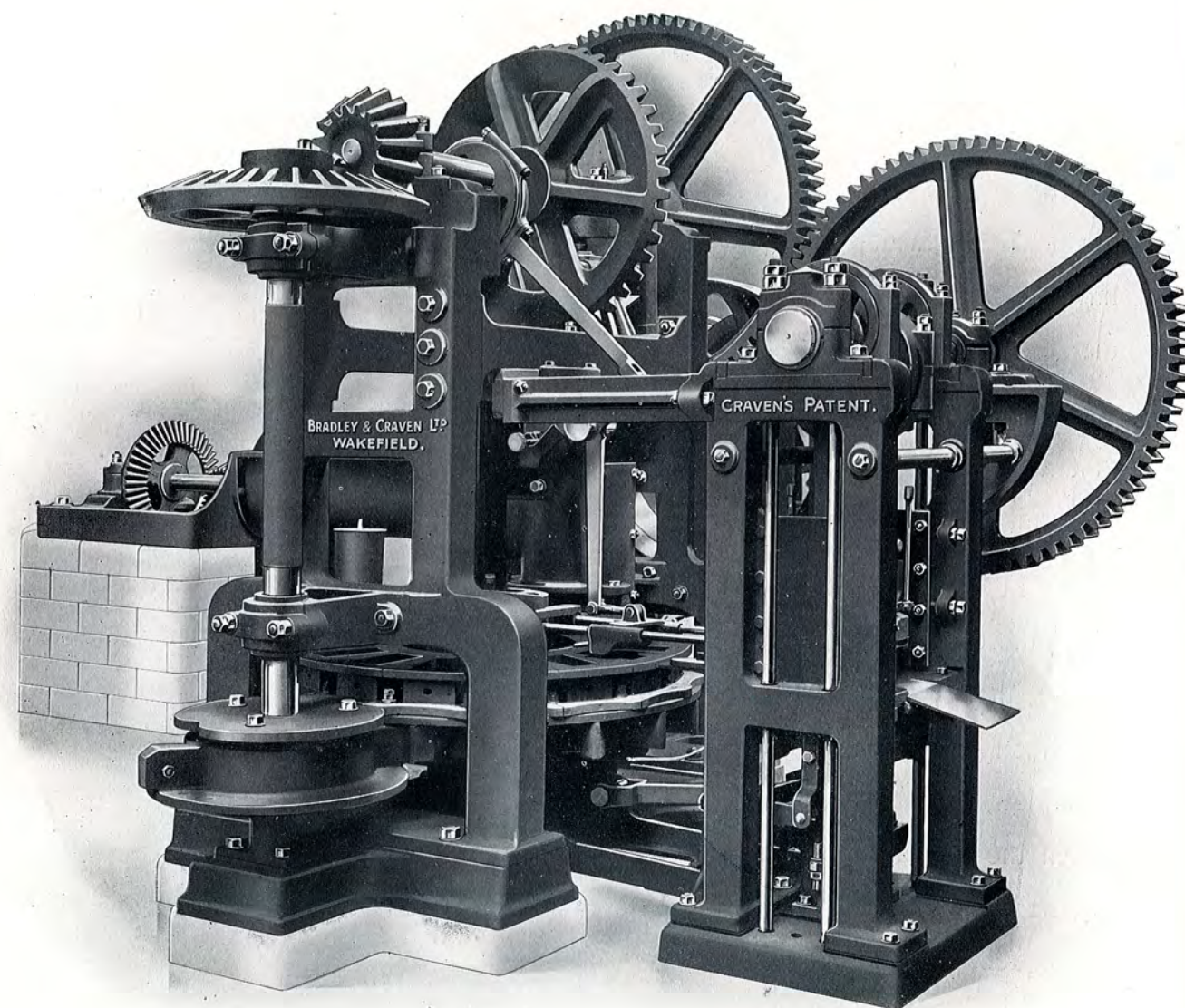
Craven's Patent No. 1 Brick-Making & Dressing Machine.

THIS MACHINE, as patented and manufactured by us, was the initiation of the system of "Stiff plastic" brick making, which has become so widely adopted. By this term we mean the production of a plastic material worked in such a stiffness, that the bricks have a density capable of carrying their own weight twenty courses high set or built in the kiln immediately they are put forth from the press.

It comprises a mixer, (either single or double according to the nature of the material to be worked), pug mill, circular rotating moulding table with dies and powerful press.

In operation, the clay is carried forward through the mixer to the pug mill, it being thoroughly mixed with the necessary amount of water in transit. The pug mill is fitted with powerful steel knives, which consolidate the particles of clay, expelling the air which is lodged between them and extruding a stream of plastic material which enters the moulds of the rotating table. We claim an important advantage for the manner in which the bricks are moulded and from the fact that they are of the same shape in outline as the finished article and the strata or grain of the brick is not destroyed by the subsequent pressing operation.

While the moulding of the bricks takes place the table remains momentarily stationary and at each partial rotation a brick is ejected from one of the sixteen moulds which form the circle, while simultaneously another is being pressed.



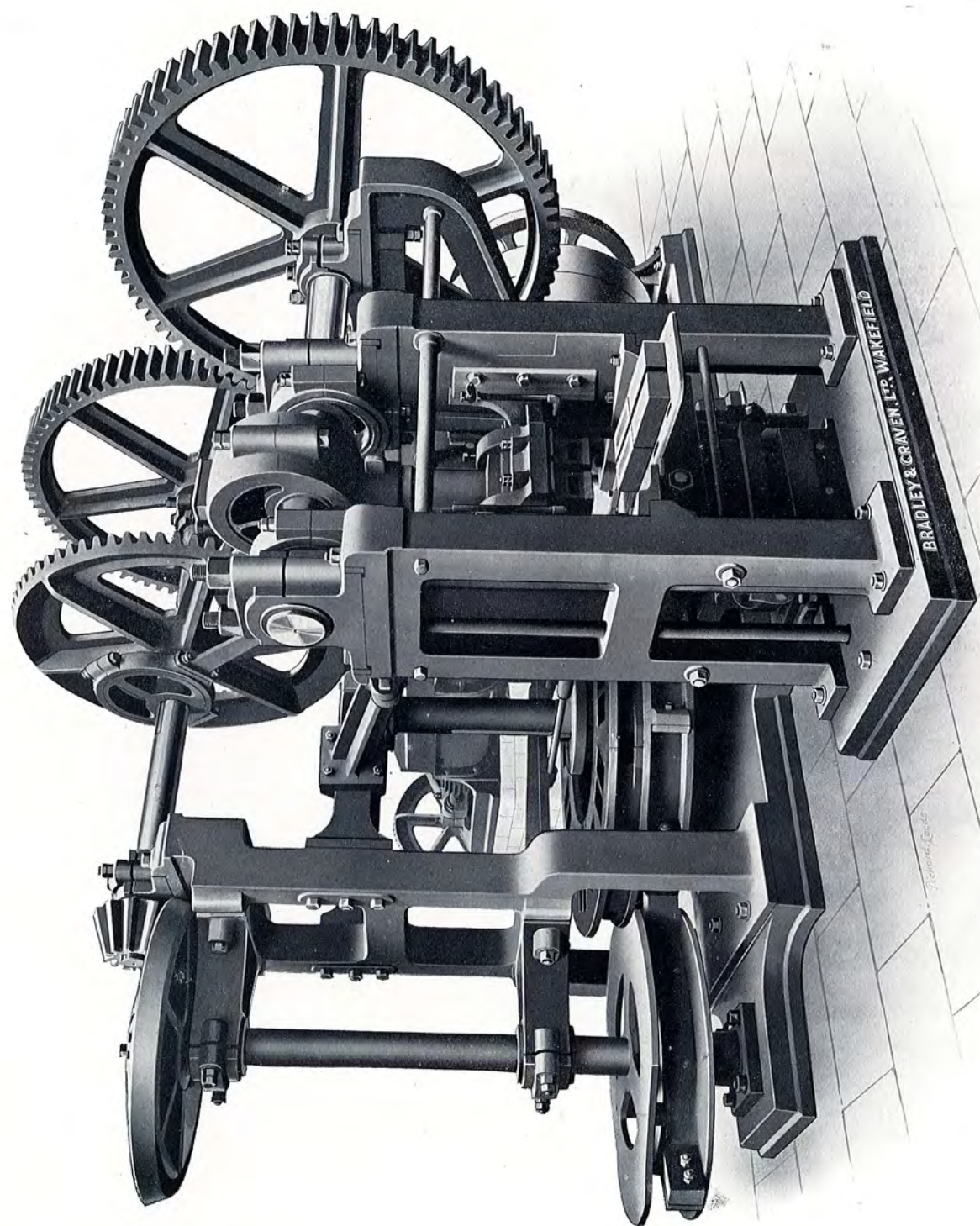
Craven's Patent No. 1 Brick-Making & Pressing Machine.

All the operations are carried out automatically by accurately timed mechanism and no handling of the bricks takes place until they are finished ready for removal on to barrows or trucks.

The only labour required in connection with the machine is one attendant at the mixer to regulate the feed and quantity of water and a boy to take off the finished bricks.

The machine is capable of producing 1,200 bricks per hour ready for immediate transference to the kiln and these when burnt have a surface of smoothness unequalled by those made on any other system, while their strength and resistance to crushing stress is of the highest standard.

Weight of the Machine with Single Mixer	-	14 Tons.
Floor Space	-	12' x 15' 9" x 10' 1½" high.
Brake Horse Power required	-	25.



Craven's Patent No. 2 Brick-Making & Dressing Machine.

THIS MACHINE, as patented and manufactured by us, was the initiation of the system of "Stiff plastic" brick making, which has become so widely adopted. By this term we mean the production of a plastic material worked in such a stiffness, that the bricks have a density capable of carrying their own weight twenty courses high set or built in the kiln immediately they are put forth from the press.

It comprises a mixer, (either single or double according to the nature of the material to be worked), pug mill, circular rotating moulding table with dies and powerful press.

In operation, the clay is carried forward through the mixer to the pug mill, it being thoroughly mixed with the necessary amount of water in transit. The pug mill is fitted with powerful steel knives, which consolidate the particles of clay, expelling the air which is lodged between them and extruding a stream of plastic material which enters the moulds of the rotating table. We claim an important advantage for the manner in which the bricks are moulded and from the fact that they are of the same shape in outline as the finished article and the strata or grain of the brick is not destroyed by the subsequent pressing operation.

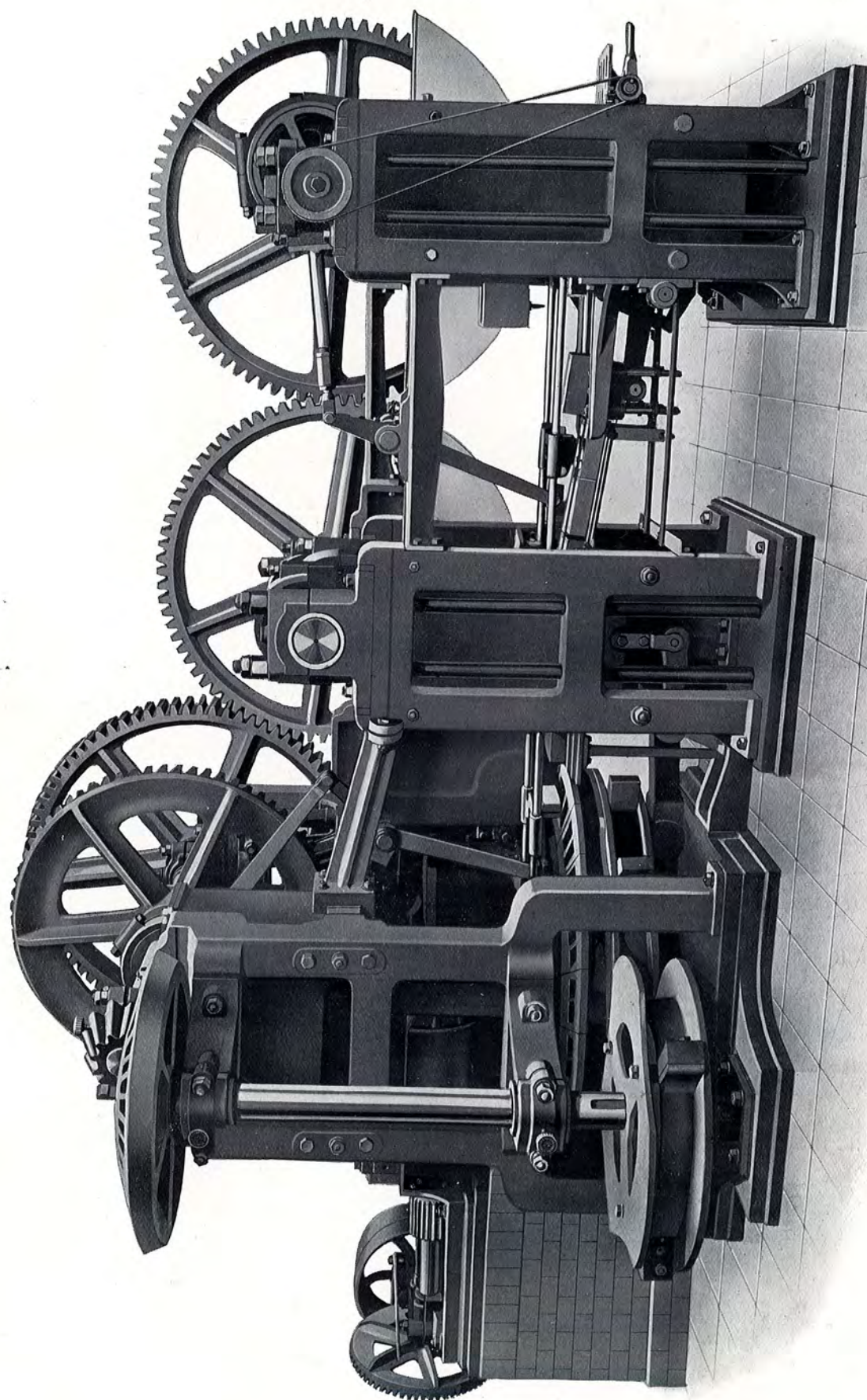
While the moulding of the bricks takes place the table remains momentarily stationary and at each partial rotation a pair of bricks are ejected from one of the twelve double moulds which form the circle, while simultaneously another pair is being pressed.

All the operations are carried out automatically by accurately timed mechanism and no handling of the bricks takes place until they are finished ready for removal on to barrows or trucks.

The only labour required in connection with the machine is one attendant at the mixer to regulate the feed and quantity of water and two boys to take off the finished bricks.

The machine is capable of producing 2,000 bricks per hour ready for immediate transference to the kiln and these when burnt have a surface of smoothness unequalled by those made on any other system, while their strength and resistance to crushing stress is of the highest standard.

Weight of the Machine with Single Mixer	-	25 Tons.
Floor Space	-	15' 11" x 17' 1" x 11' 4½" high.
Brake Horse Power required	-	40 to 45.

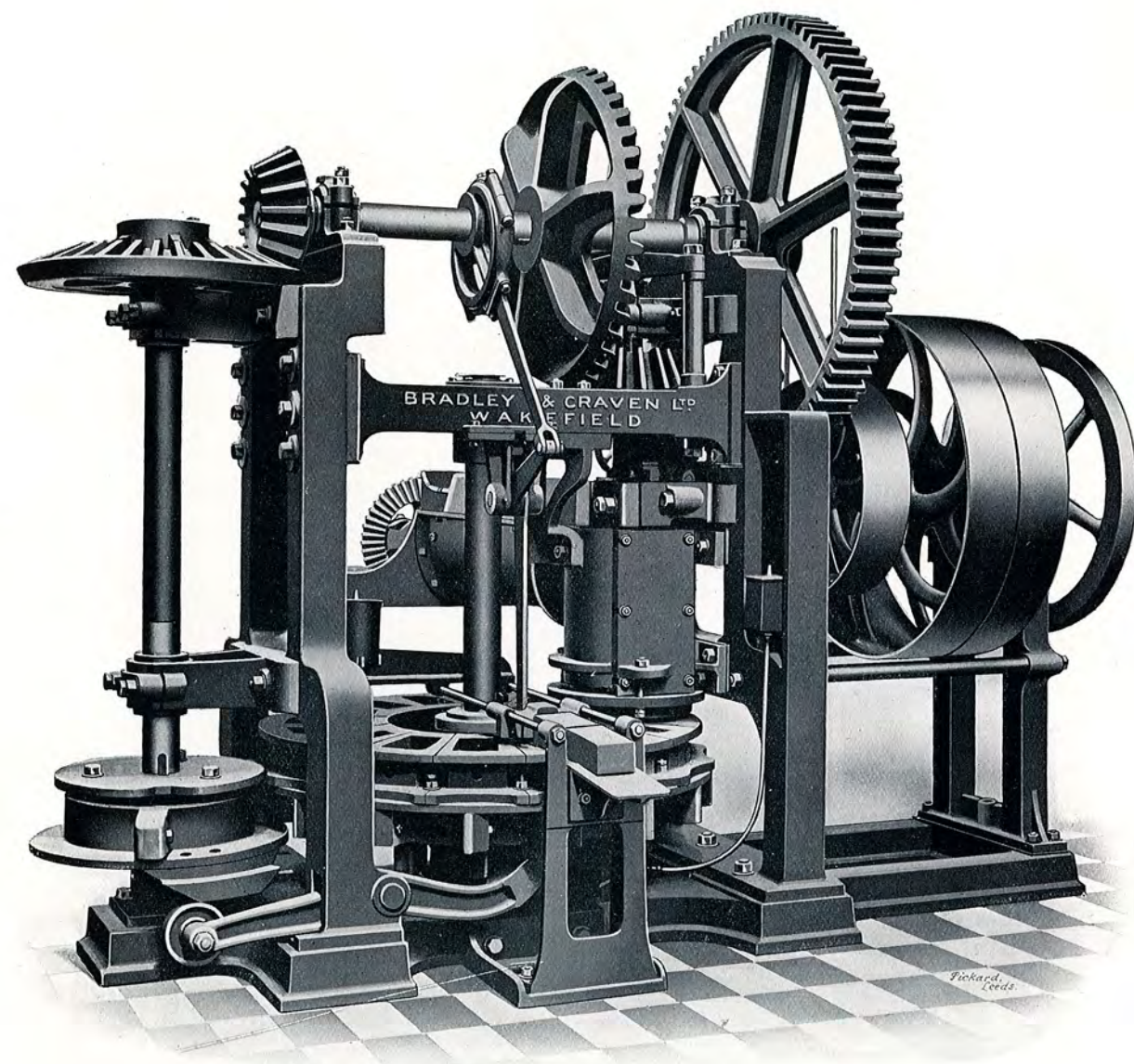


Craven's Patent No. 2 Brick-Making Machine with Re=press Combined.

THE demand for facing brick and the high cost of labour has stimulated the makers to produce a Machine to meet the want. The first processes of brick-making are carried out in the usual manner by our No. 2 Machine, and after the bricks are delivered from the press of the machine, they travel down a slightly inclined plane on to a plate which is lifted by suitable mechanism for the feeding motion to come into play and deliver them to the Re=press. This Re=press is driven direct from the first or machine press and all handling of the bricks is avoided until they are in a finished form ready for the wagons or barrows. Not only is the labor saving an important item, but the percentage of waste is reduced to a minimum. All the mechanism is self-acting and capable of adjustment.

We cannot too strongly recommend this combination when goods of the highest quality are in demand. These combined Machines are in operation at the Works of the principal Brick Companies in this country with the greatest success.

Weight of Machine for Shipment	-	32 Tons.
Floor Space	-	24' 2" x 16' 3" x 11' 3" high.
Brake Horse Power required	-	45 to 50.



Craven's Patent No. 4. Brick-Making Machine.

THE MACHINE comprises a mixer, pug-mill and circular rotating moulding table, and bricks of great density can be moulded of perfect form, requiring no pressing.

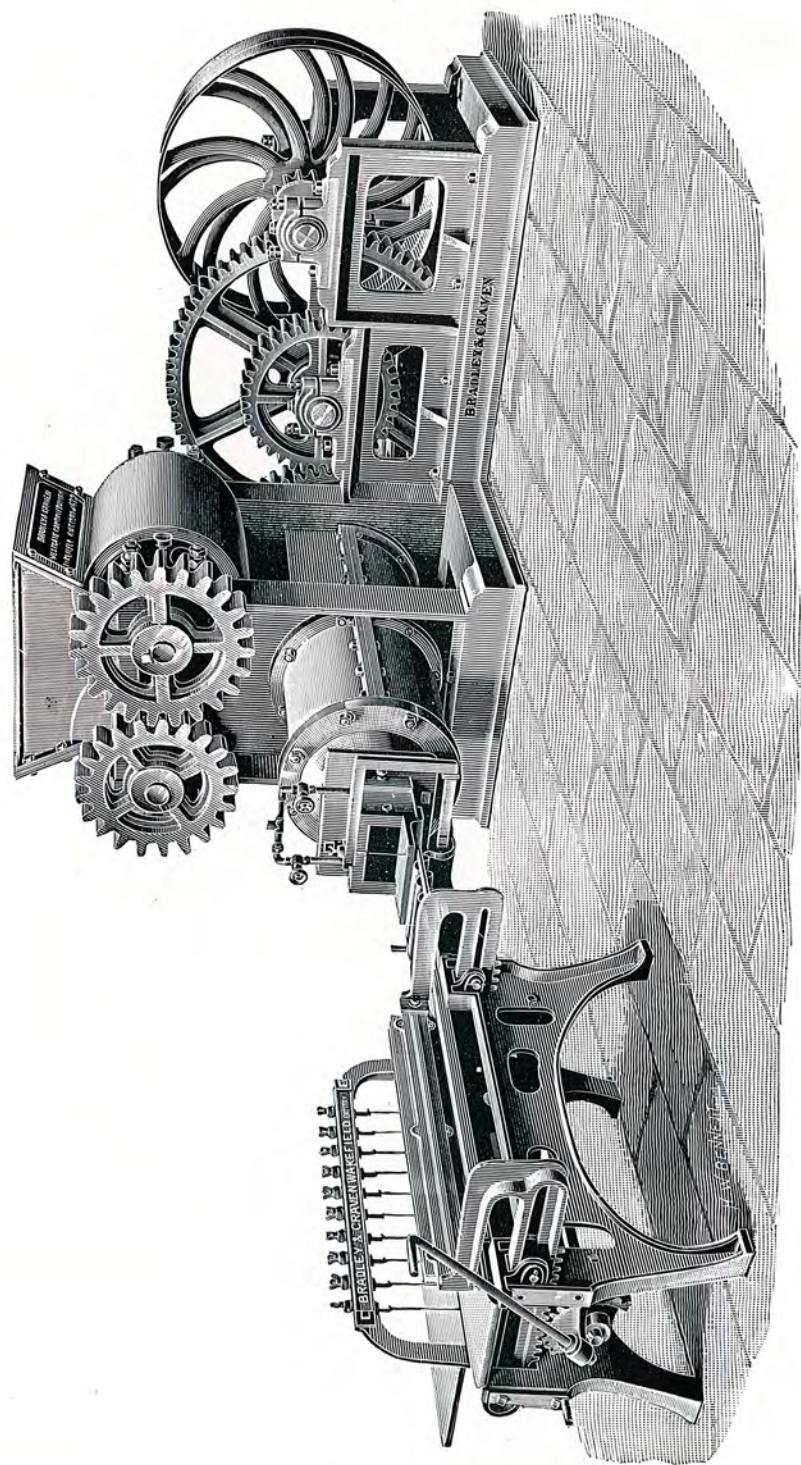
The clay is fed into the mixer, which may be of varied design to suit the material to be worked and a thorough mixing of the clay and water takes place, at the same time it is being propelled to the vertical pug mill to be moulded into bricks in the dies or moulds fixed on the surface of the table. The motion which works the table is of the eccentric type and accelerates the passage of one mould to the other under the pug mill reducing to a minimum the time it is acting on the dead space or plate between the moulds. As each of the series of moulds passes under the mouth of the pug mill a brick is cleanly cut off close to the top. The bricks are ejected from the die or mould by the pistons and lifting up lever worked from the tappet shaft.

It is obvious that the bricks produced by this Machine are of truer form than those made by a wire-cutting brick machine, as they are moulded in dies, and there is no tearing of the clay in forcing through a die or by cutting off with wires.

The Machine is very strongly constructed, and being mounted on a massive cast-iron base plate it requires but little foundation. It is especially adapted for Contractors, being easily removed, and will work almost any kind of clay possible to be made into bricks.

This Machine is capable of producing 12,000 bricks per day of 9½ hours.

Weight of Machine for Shipment	-	-	10 Tons.
Floor Space	-	-	11' 8" × 12' 0" × 10' 1½" high.
Brake Horse Power required	-	-	20.



Plastic Clay Brick-Making Machine.

FOR this type of Machine there is always a demand, as they are simple, inexpensive, and will turn out a large quantity of bricks.

We have carefully designed this Machine to insure durability of wear and efficiency in working.

The Roller Shells are made of our Special Chilled Iron, and being secured to detachable ends, are readily renewable. The shafts are of forged high carbon steel of extra large diameter, and all bearings are fitted with gun-metal bushes.

The Pug Mill Shaft is of forged steel, fitted with improved thrust bearings to take the resistance of the knives.

The Pug Mill Knives are of "Era" Manganese Steel.

The Gearing is very strong and made entirely from our special mixture of "wheel-metal."

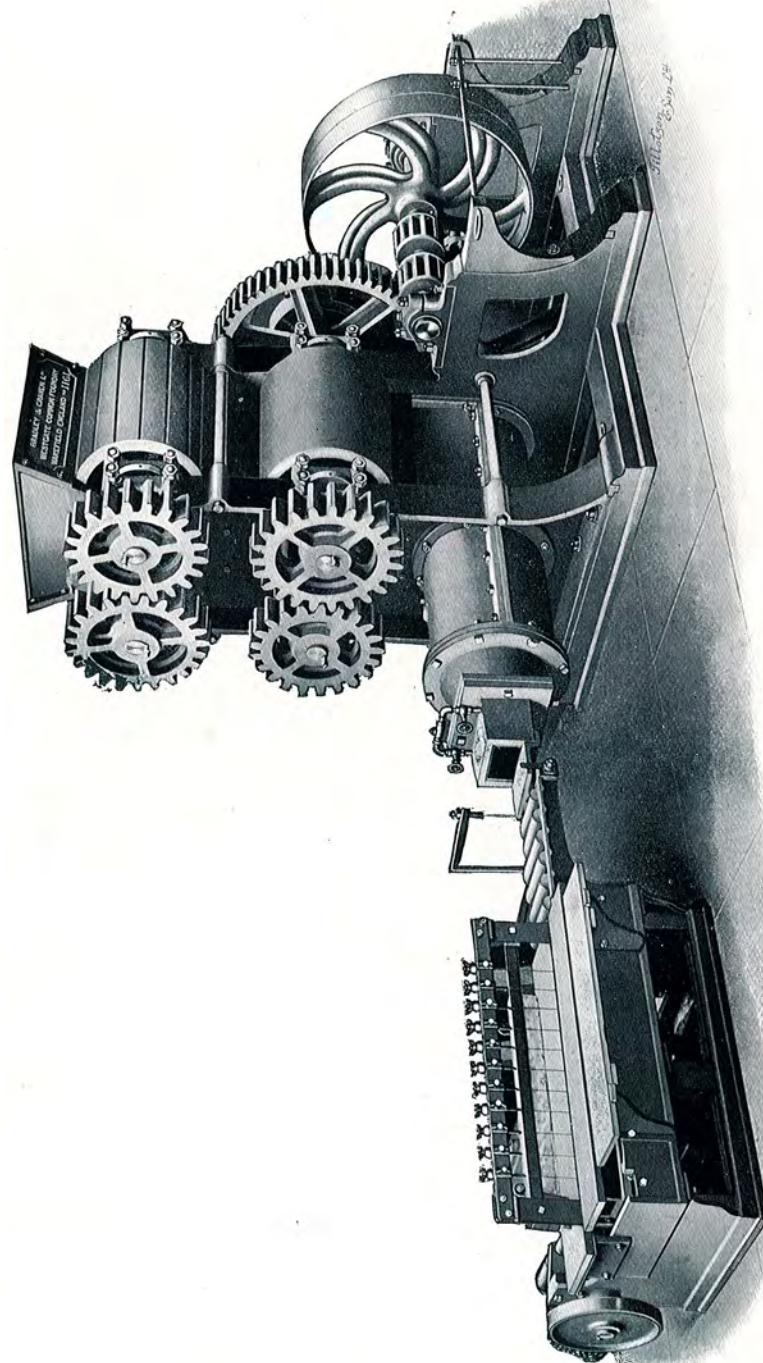
The Machine is most powerfully geared and the driving pulleys are extra large to prevent slipping of the belt.

The Die is self-lubricating and lined with best crucible cast steel plates.

The whole Machine is mounted on a strong Cast Iron Bed Plate of box section, and is entirely self-contained.

The Cutting Table for the smaller Machines is of the "Murray" hand type, but for the larger Machines we recommend Take's Patent Power Automatic Cutting Table of which we are sole makers.

	Approximate Shipping Weight. TONS.	Floor Space.	Approximate Brake Horse Power required.
14" dia. Pug Mill Machine	- 7½	16' 6" x 5' 9" x 5' 10½" high	20
19" do. do.	- 10½	22' 9" x 7' 10" x 6' 8" high	35
24" do. do.	- 17	23' 0" x 9' 0" x 8' 3" high	55



Plastic Clay Brick-Making Machine.

THE MACHINE, as here represented, is similar in design to the one on the previous page, but is fitted with two pairs of powerful crushing rollers in place of one pair as in the other Machine.

The top pair of rollers is of improved design to grip the clay and prevent skidding, and each pair is fitted with friction clutches to avoid breakages, should any foreign material get in.

The Roller Shells are made of our Special Chilled Iron, and being secured to detachable ends, are readily renewable. The shafts are of forged high carbon steel of extra large diameter, and all bearings are fitted with gun-metal bushes.

The Pug Mill Shaft is of forged steel, fitted with improved thrust bearing running in oil to take the resistance of the knives, which latter are of "Era" manganese steel.

The Gearing is very strong and made entirely from our special mixture of "wheel-metal."

The Machine is most powerfully geared and the driving pulleys are extra large to prevent slipping of the belt.

The Die is self-lubricating, and lined with best steel plates, and of the most approved design.

The whole Machine is mounted on a strong Cast Iron Bed Plate of box section, and is entirely self-contained.

This Machine is provided with Take's Patent Power Cutting Table, and if required can be fitted with Separator also, which efficiently spaces the bricks ready for placing on drying cars.

	Approximate Shipping Weight.	Floor Space.	Approximate Brake Horse Power required.
14" dia. Pug Mill Machine	- 8 $\frac{3}{4}$	16' 9" x 5' 9" x 7' 5" high	25
19" do. do.	- 12	22' 9" x 7' 10" x 9' 6" high	42
24" do. do. (Double Delivery)	- 20 $\frac{1}{2}$	21' 6" x 14' 6" x 11' 8" high	65



Sludge Pan and Pug Mill

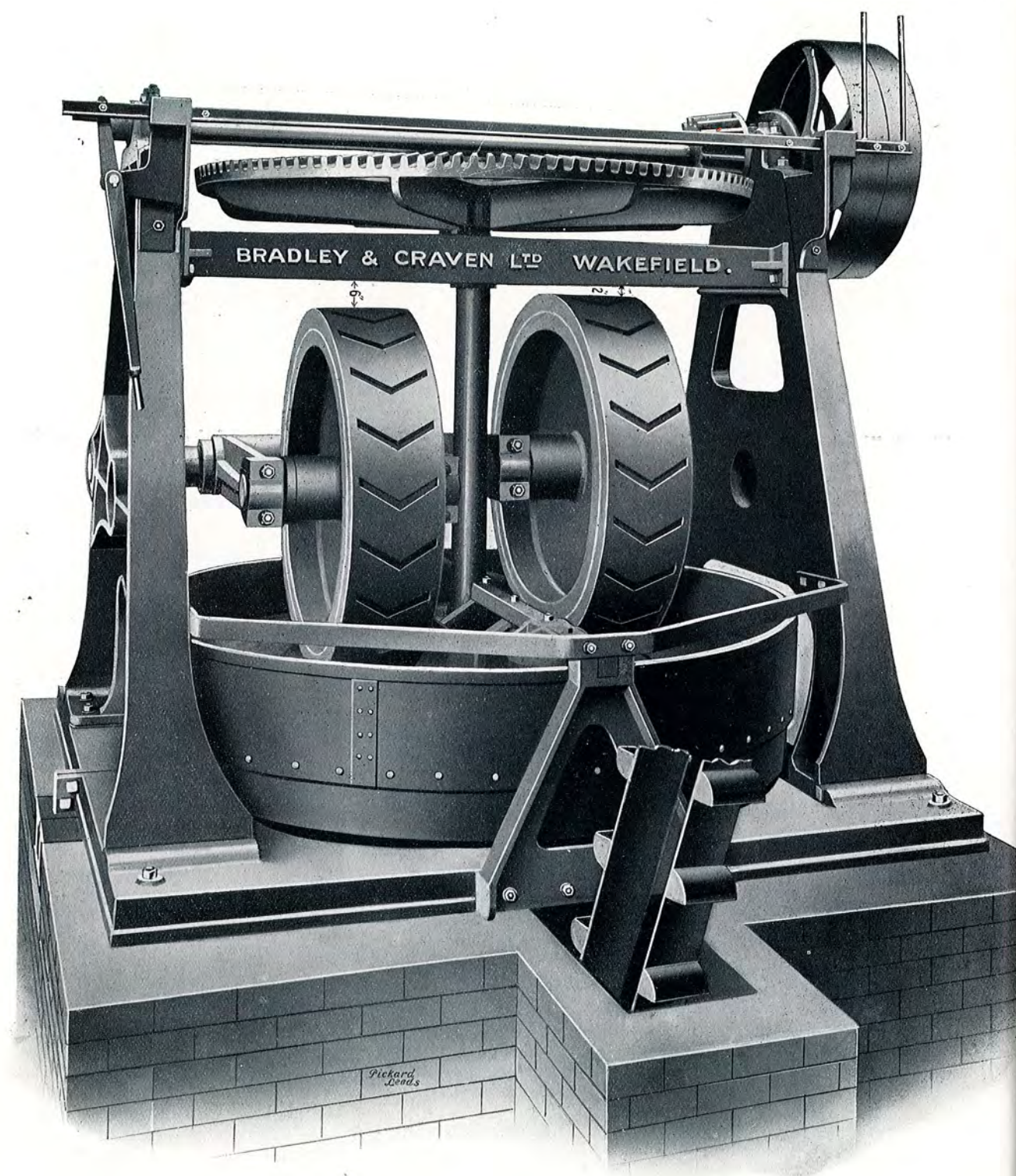
(7ft. diameter Pan).

THE illustration opposite represents a very useful Machine for mixing and preparing fire and other clays to a condition suitable for hand moulding.

The upper pan or sludge pan is fitted with revolving arms to which knives are attached and herein water is added to reduce the materials to any consistency.

The Pug Mill is of large capacity and the gearing is proportionately strong. The outlet at the bottom of pug is operated by levers.

Weight of the Machine for Shipment	-	-	3½ Tons.
Floor Space	-	-	8' 6" × 11' 6" × 7' 3" high.
Brake Horse Power required	-	-	10.



Perforated Revolving Clay Mill

(Over-Driven Open Base Type).

IN the type of Grinding Mill shown opposite the Pan revolves, being fixed on a centre steel shaft, which takes its bearing in a step mounted on two steel girders, thus driving the heavy rollers and crushing the material.

The centre of the pan and that part on which the material is crushed is of solid metal, while the outer or larger diameter of the pan is fitted with gratings of various sized perforations over which the crushed rock or clay is spread—that which will not pass the grating is returned under the rollers to be re-ground.

The dust that passes the grating is received in the hopper-shaped foundations, falling into the elevator well, from whence it is raised to any desired platform.

The rollers, which are hooped with “chilled” iron renewable tyres, are mounted in movable arms, these being held by a steel shaft running through each arm and taking a bearing in the two main standards; they rise and fall independently of each other according to the charge of clay which they ride over, and thus by their weight and the grinding action of the rotating pan underneath the rollers, break it down.

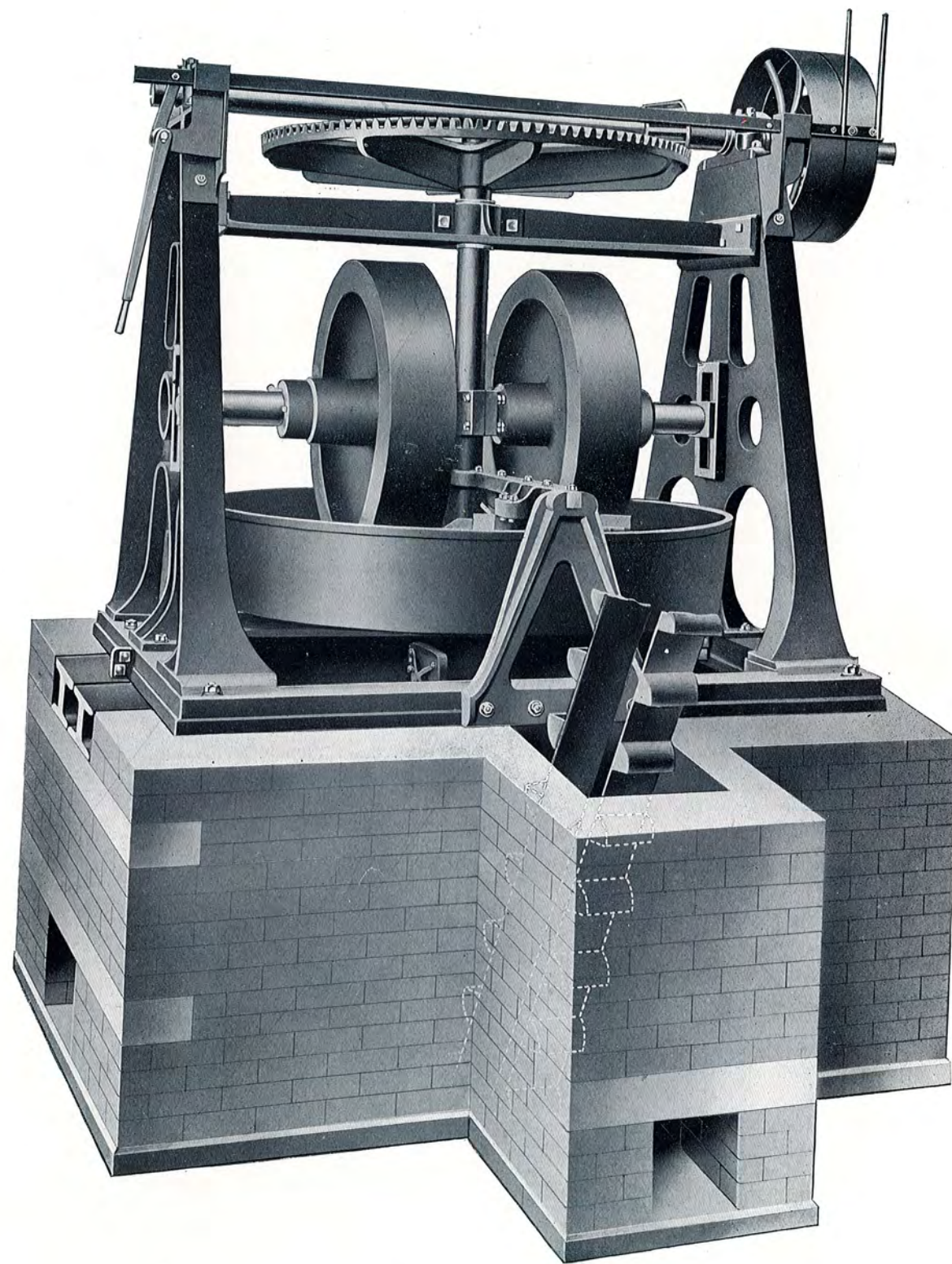
It will more easily explain the independent movement of the rollers on reference to the illustration, the one on the left hand is shewn 6" from the crossbar, from which it is to be assumed that only a thin layer of material is underneath it, while the right hand one is raised within 2" of the bar, the difference representing the thickness of the material being crushed.

Every part of this Grinding Mill is truly planed and fitted, ensuring extreme rigidity, and enabling it to be run at a high speed without vibration, thus greatly increasing the production.

The illustration represents our standard sizes, 9ft. and 10ft. Mills, and we give below specification of the 10ft. Mill.

Revolving pan fitted with steel rim and cast iron renewable linings. Steel pan shaft, 10in. diam. at footstep with 6½in. diam. neck in cross standard. Steel driving shaft 5in. diam. with collars forged on. Crown wheel 8ft. 7¼in. diam., 2¼in. pitch, 8in. broad, pinion 14¼in. diam. flanged to point of tooth. Rollers 5ft. 6in. diam., 16in. broad, fitted with special chilled iron tyres of any desired weight. Fast and loose driving pulleys 4ft. diam. by 8in. broad.

Weight of 10ft. Mill for Shipment	-	25 Tons.
Floor Space	-	11' 6" × 14' 0" × 12' 0" high from ground level.
Brake Horse Power required	-	22.



Perforated Revolving Clay Mill

(Open Base Type).

THIS design of Mill varies little from that illustrated on the preceding page. From the description of the latter it will have been observed that one of the chief characteristics is the principle of carrying each roller in separate arms, but in the Mill illustrated opposite this feature is not embodied, both rollers being supported on one centre spindle having a cast iron boss and mild steel ends, not cast iron throughout as adopted in other makers' Mills. In all other respects the Mill is identical with that on the previous page.

Weight of 9ft. Mill for Shipment	-	22 Tons.
Floor Space	-	10' 6" × 13' 6" × 11' 4" high from ground level.
Brake Horse Power required	-	18 to 20.



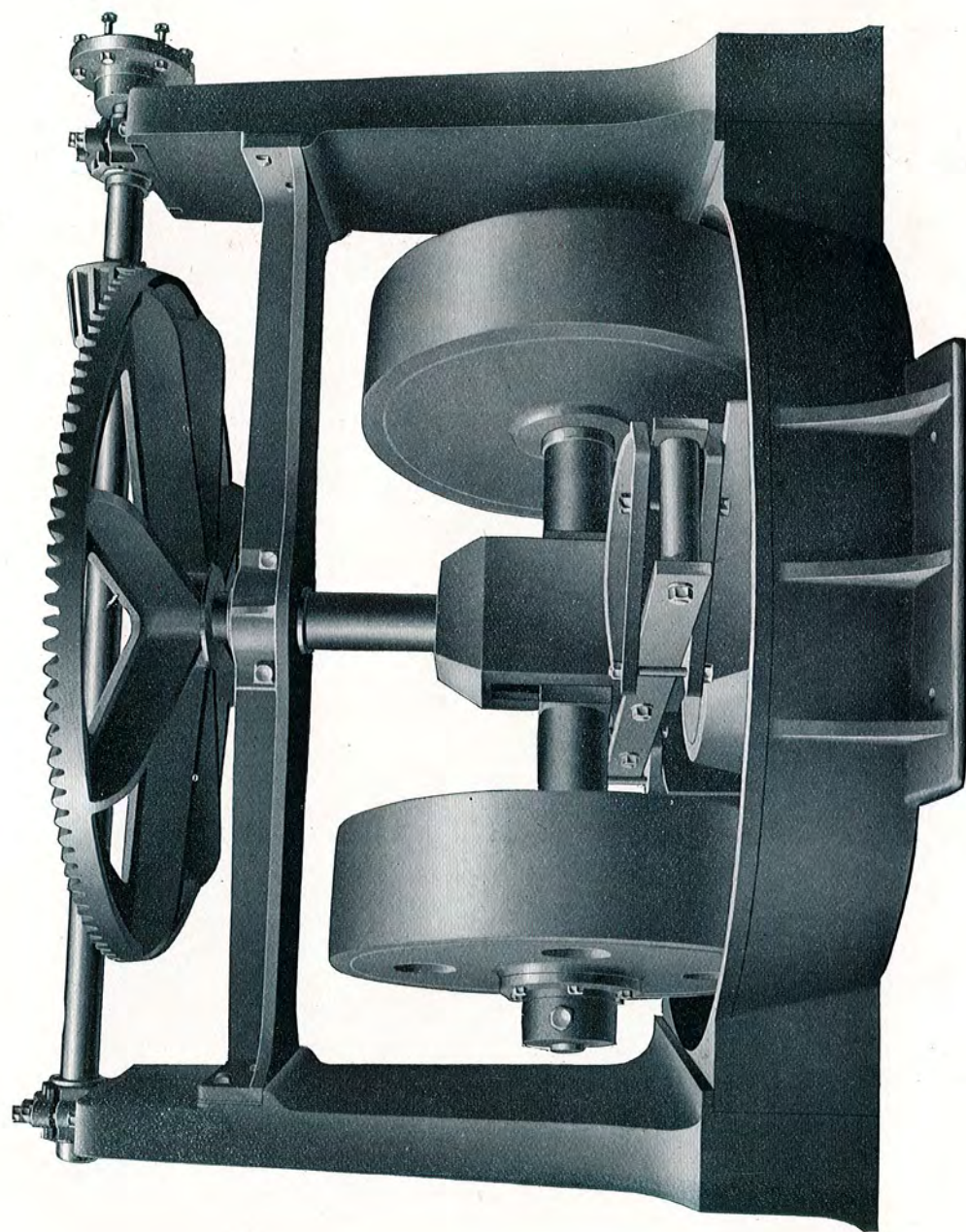
Perforated Revolving Clay Mill

(With Receiving Dish).

THE annexed engraving represents our over-driven type of Mill with receiving dish or saucer, and in other respects is similar to those described on the preceding pages.

This Mill is recommended in cases where it is difficult to get dry foundations for the open base type, moisture being very troublesome to the working of the elevators. In this, the finely ground clay, after passing through the perforations in grates, falls into the receiving dish, and by the rotation of scrapers is automatically discharged through a large orifice to the elevator boot at the front of Mill.

	Approximate Shipping Weight.	Floor Space.	Approximate Brake Horse Power required.
	TONS.		
Mill 9ft. dia.	- 22½	10' 1" × 12' 10" × 12' 6" high	18 to 20
Do. 7ft. do.	- 13	8' 6" × 10' 7" × 10' 8" high	15



Wet or Plastic Clay Grinding Mill.

THIS type of Mill, as illustrated on opposite page, has proved very useful for grinding plastic clays as well as for mixing powdered materials for working in conjunction with our Stiff Plastic Brick Machines, Nos. 1 and 2.

For plastic clays and those containing stones or very hard lumps the Machine is eminently adapted. The clay is fed into the pan, and the rollers pass over it until it is reduced to such a fineness as to be forced through a steel grid, which is fitted in one section of the bottom or grinding plate. The Mill can either be fixed direct over the Brick Machine for the clay to drop into it or on the ground floor. In the latter case an elevator or conveyor belt is fixed under the grid for conveying the prepared material to any desired point.

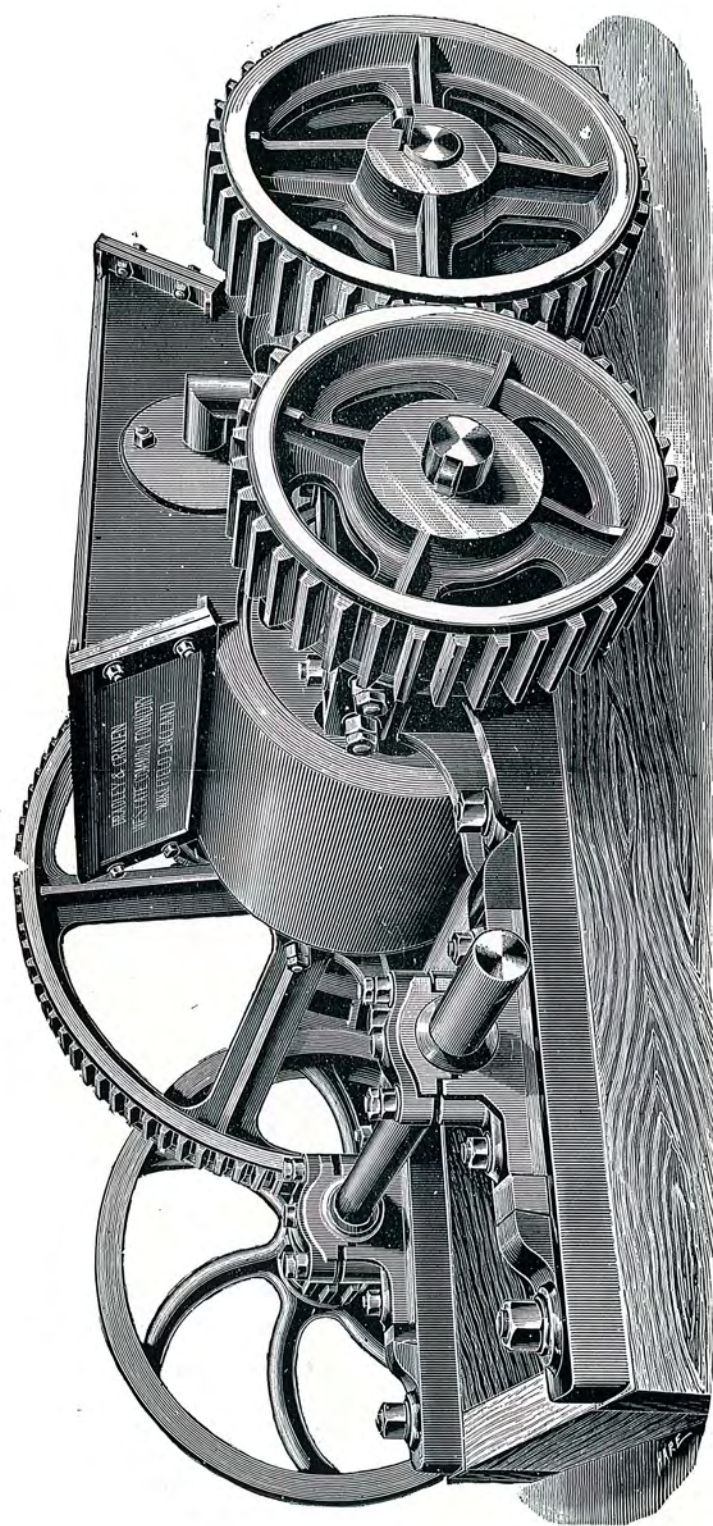
When used as Mixing Mill only, the powdered clay is delivered into the centre of the Mill and water is applied in a suitable position, the rollers pass over the clay and thoroughly mix the water into it; by the action of the scrapers the material is brought round to the grid, through which it is delivered to the mixer of the Brick Machine.

The rollers, hooped with our Special Hard Iron Tyres, are made of any desired weight, to suit the materials to be treated.

The Mill is very substantially built, and all the parts are truly machined where fitting together, thus forming a very strong and rigid Machine.

These Mills are made in two sizes—7 feet and 9 feet diameter.

	Approximate Shipping Weight. TONS.	Floor Space.	Approximate Brake Horse Power required.
Mill 9ft. dia. -	20 $\frac{3}{4}$	9' 4" x 13' 0" x 10' 3" high	15 to 18
Do. 7ft. do. -	11 $\frac{1}{2}$	8' 0" x 8' 0" x 8' 3" high	10 to 12



Horizontal Clay Crushing Rollers.

THE annexed illustration represents a very useful Machine for preparing clays; it crushes all hard lumps and stones which could not be acted upon by a pug-mill.

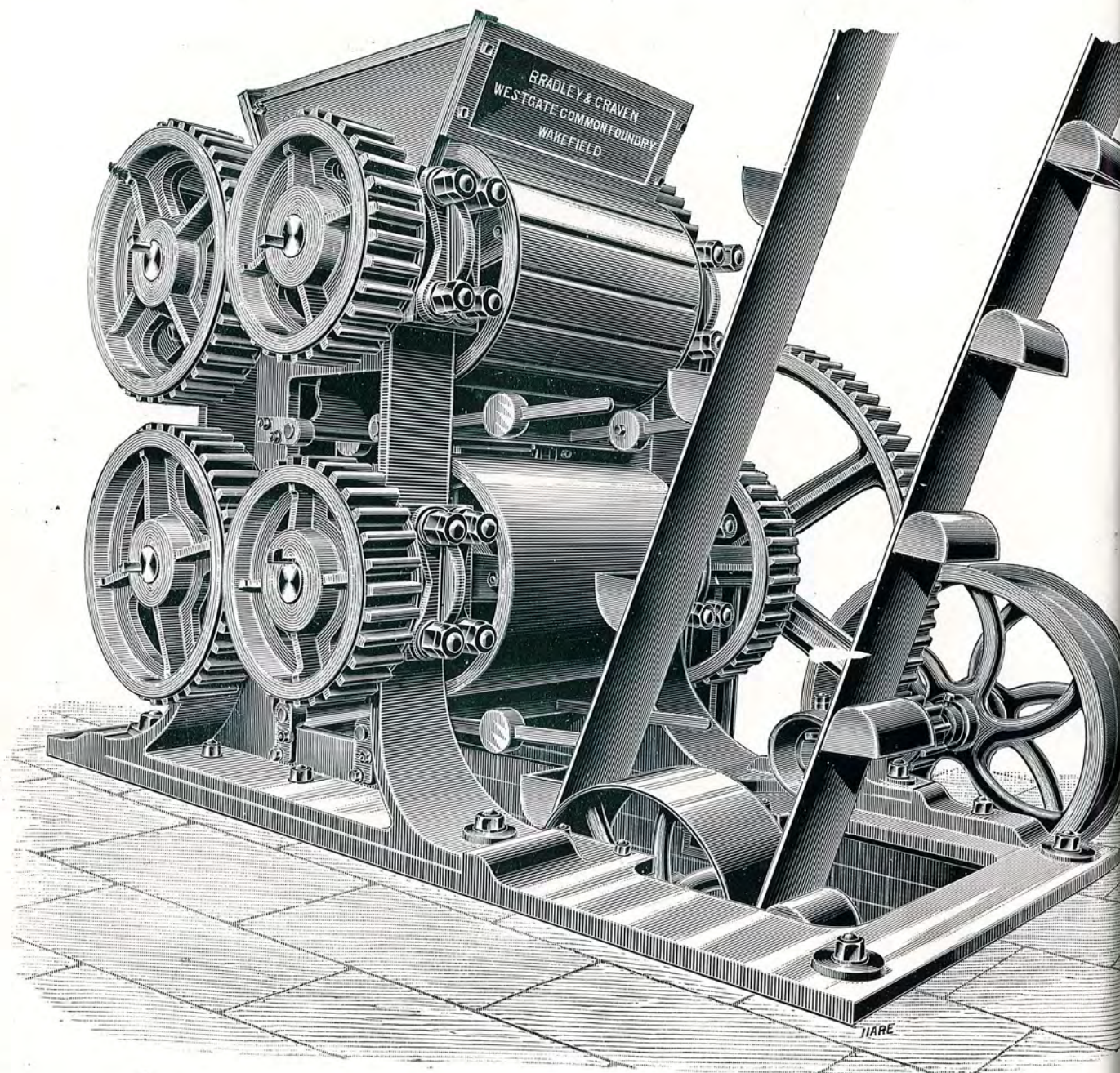
These rollers are constructed of several sizes, and for some clays it is necessary to employ two or three pairs below each other to reduce hard material in order to produce the best bricks.

The single pair of rollers are fixed on one frame, which is bolted to the wooden foundation, so that comparatively no trouble or expense attends the fixing of them.

The two rollers are rotated at different speeds, they then not only crush the hard lumps with less power, but the rubbing action thus produced reduces the material more thoroughly than if rotating at equal speeds. The rollers are made from a special mixture of very hard metal, thus reducing the wear and tear to a minimum.

These Machines are very strong and rigid; longitudinal bolts taking the weight of the crushing pressure.

	Approximate Shipping Weight.	Floor Space.	Approximate Brake Horse Power required.
20 in. x 20 in. Rollers	- 3 tons 10 cwts.	6' 9" x 7' 4" x 2' 4" high	12
24 in. x 29½ in. "	- 5 " 10 "	8' 1" x 8' 2" x 2' 4" high	15



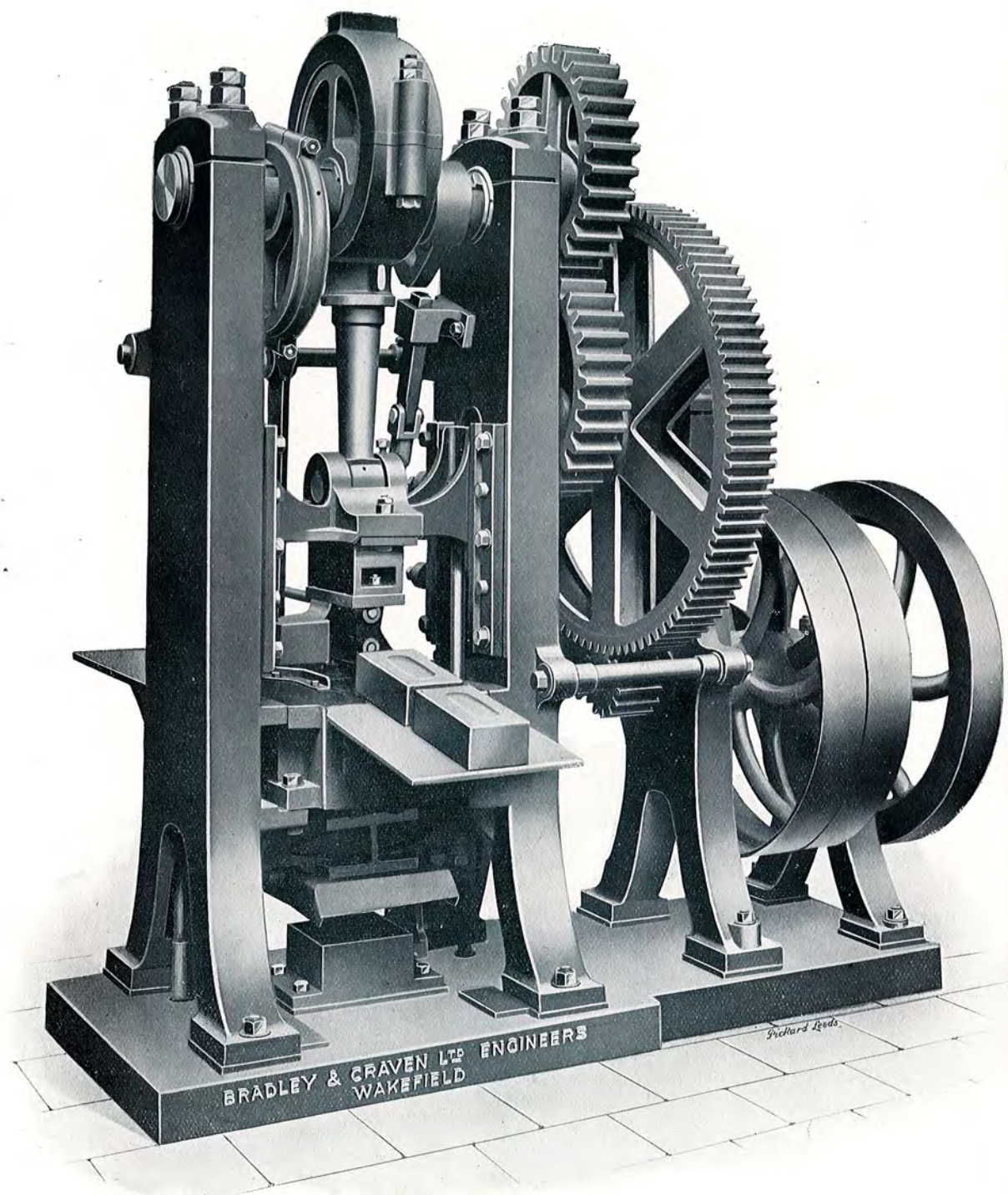
Double Clay Crushing Rollers.

THE preparation of clay previous to being manipulated in the Brick-making Machine is an important part in producing good bricks. Almost every material requires some preliminary preparation, either to reduce the hard bodies to a fine powder, crush stones or hard lumps, or incorporate the different strata of clay, and these processes are accomplished by the employment of the perforated grinding mill or clay crushing rollers. The illustration opposite represents the makers' improved double clay crushing rollers.

The frames are very strong, and longitudinal bolts take the entire weight of the crushing pressure. The shafts are made of the best forged steel and have extra long bearings bushed with gun metal. The rollers are 2ft. 6in. diameter by 24in. long cast from a special mixture of hard iron and fitted with loose ends securely attached to the roller bodies.

The Rollers are mounted on a strong cast-iron base plate. The elevators are attached to the base plate at the bottom end; the buckets are of pressed seamless steel; the belt is of best quality Balata, and the top shaft has adjustable screws to the bearings, so that the belt can be kept taut.

	Approximate Shipping Weight. TONS.	Floor Space.	Approximate Brake Horse Power required.
2ft. 6in. dia. × 2ft. 6in. long Rollers	13	6' 2" × 9' 8" × 8' 2" high	25



Craven's Patent Power Brick and Tile Press (With variable Speed of Crosshead).

THE illustration opposite represents our latest type of Re-press in which the ascent and descent of the crosshead is variable, giving increased power in the gearing; and for producing a high class facing brick in conjunction with our Patent Brick-Making Machines it is unequalled by any other on the market.

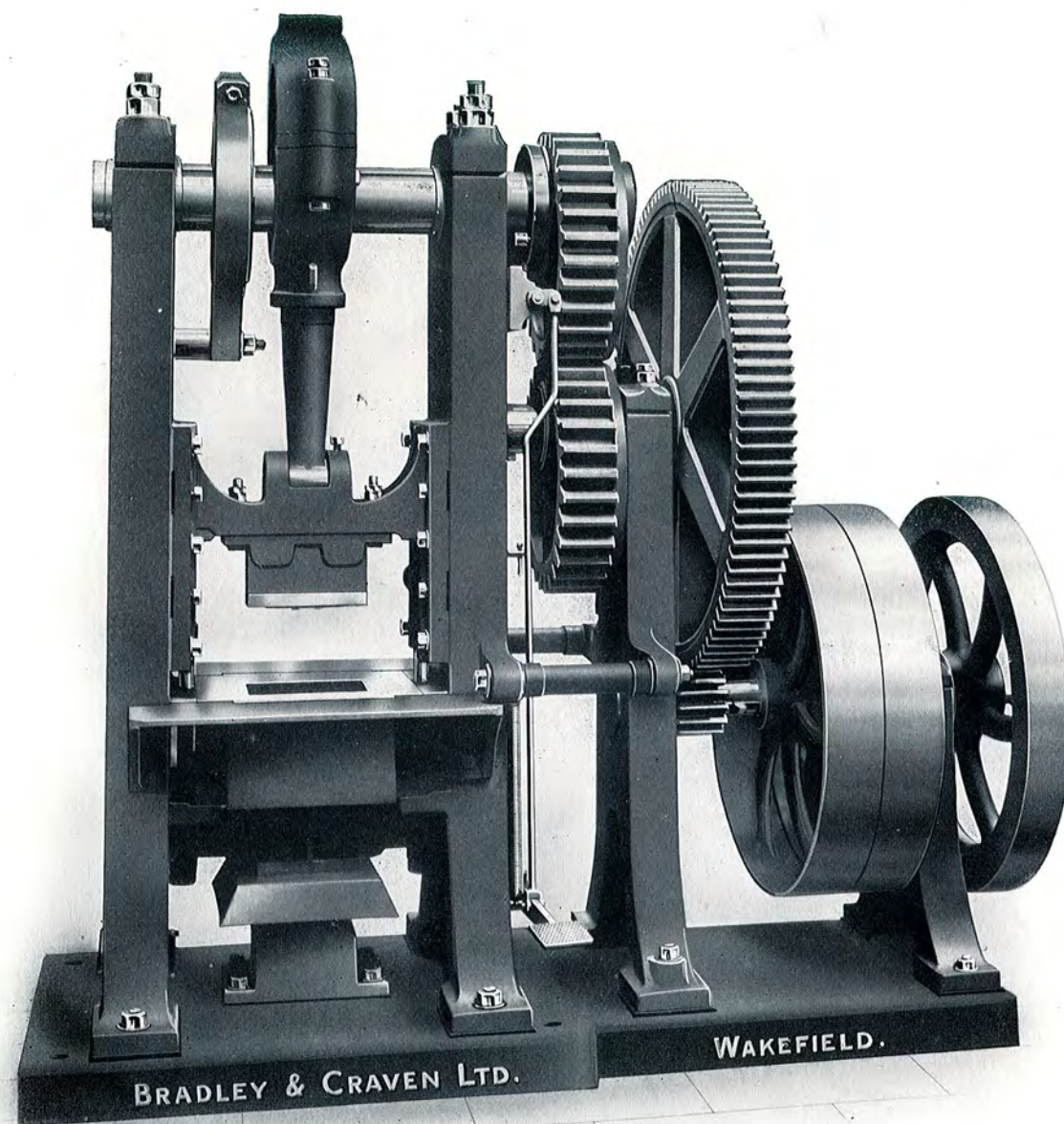
From the illustration the action will be readily understood. The steel pressing shaft on which the eccentric is keyed is driven by a pair of elliptical wheels and the power for driving these is transmitted through a pair of machine-cut spur wheels and fast and loose pulleys. When the crosshead is descending the elliptical wheels accelerate the motion until approaching the end of the stroke where the pressing takes place; the ratio of the gearing is then at its maximum, and the speed being retarded permits the superfluous clay liberated through the vent holes in the piston to travel out at a slower rate, obviating any "drawing" or contracting of the brick at the point of exit and much sounder work results. When the eccentric has passed over the centre the speed of the upward stroke is again accelerated.

The gearing is very strong and we can, by this means, gain a larger ratio than in any other Press on the market.

The bricks are fed in automatically by a conveniently devised feeding gear, so that there is no danger to the attendants working the Press.

The die is steam heated, and the linings are of special "Ubas" steel, case hardened and ground, ensuring great durability.

Weight for Shipment	-	-	3½ Tons.
Floor Space	-	-	6' 4" x 3' 3" x 6' 11" high.
Brake Horse Power required	-	-	5.

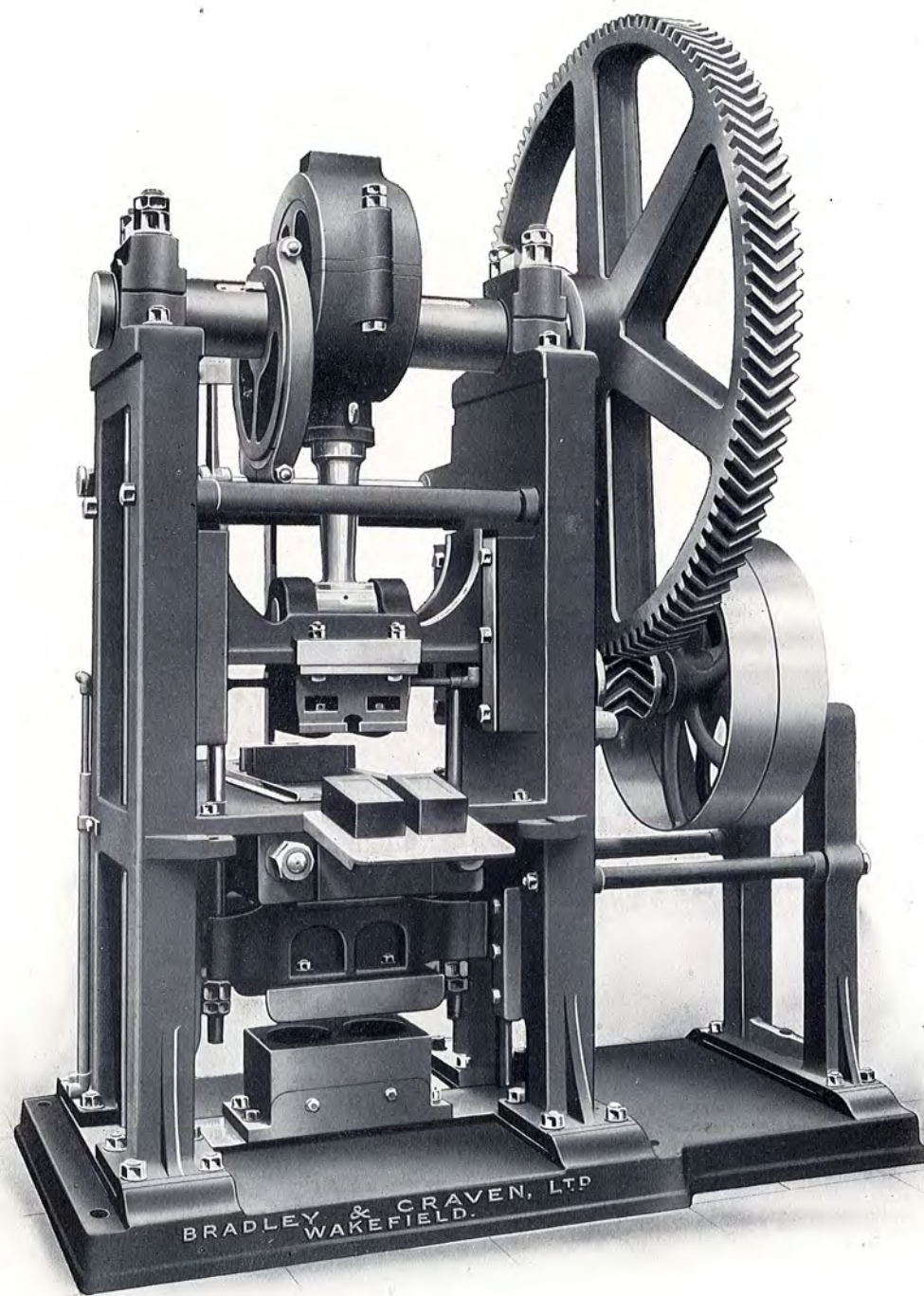


Craven's Patent Power Brick and Tile Press (With Automatic Stopping Motion).

THE Press illustrated on the opposite page has been designed for the production of such ornamental and odd-shaped goods which on account of their shape renders it imperative that they should be placed in and removed from the die by hand.

It is similar to the one on page 34 with the exception that in lieu of the automatic feeder our Improved Roller Key Clutch is fitted, by the operation of which the pressing eccentric is positively stopped at the top of each stroke, and the downward motion cannot commence until the foot lever is depressed by the attendant; all risk of injury in handling is therefore eliminated.

Weight for Shipment	-	- 75 cwts.
Floor Space	-	- 6' 8" x 3' 2" x 6' 10" high.
Brake Horse Power required	-	- 5.



Craven's Patent Double-Die Brick Press.

THE Press which we illustrate on the opposite page is adapted for re-pressing facing bricks in large quantities, and especially for working in conjunction with our Craven's Patent No. 2 Brick-Making Machine.

The Pressing Shaft is of forged high carbon steel, machined all over and supported in gun-metal bushed bearings of extra large area, the caps of which are held in position by special SSSS steel bolts, $1\frac{3}{4}$ in. diameter, extending through bed-plate of Press to take the pressing strain.

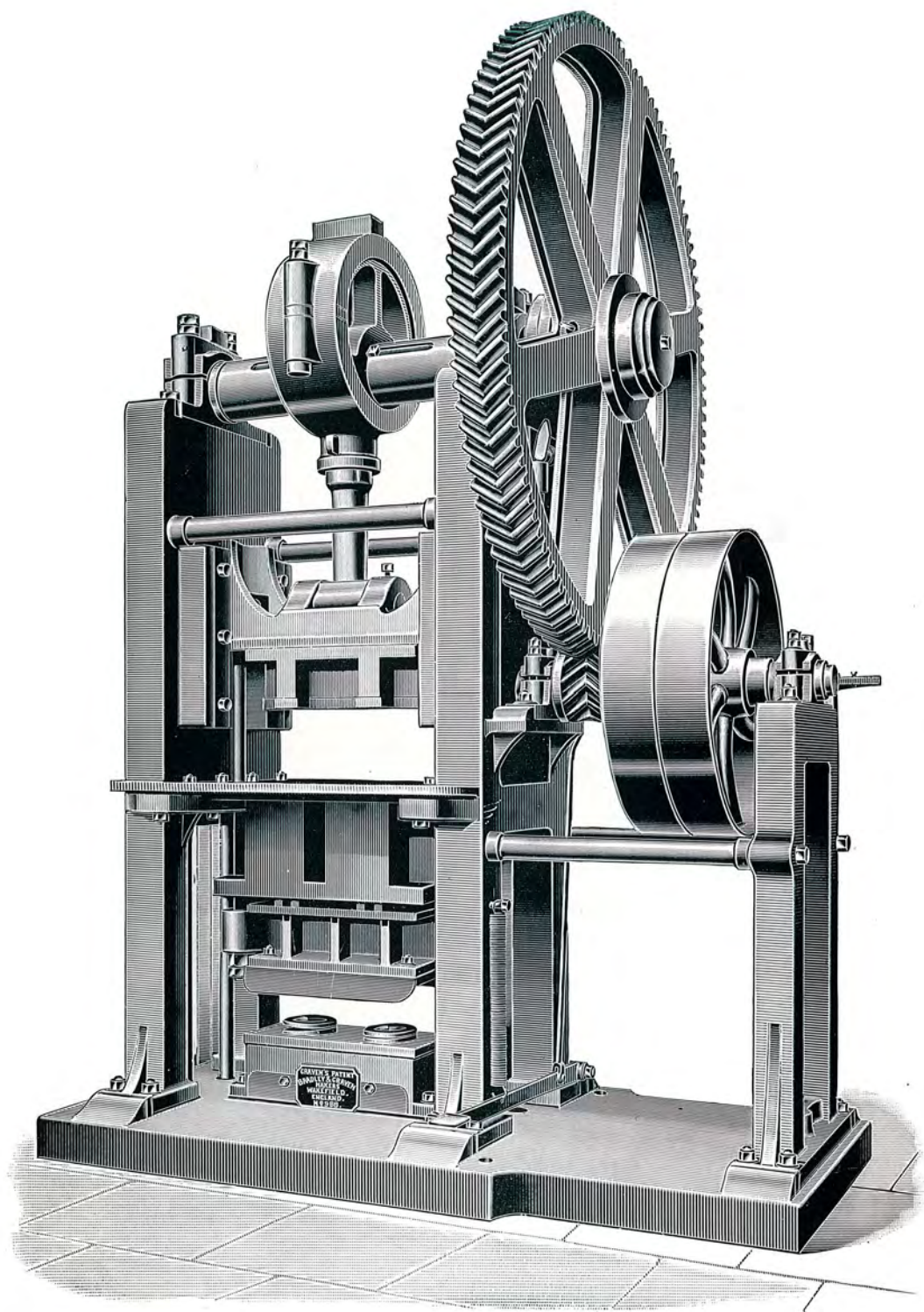
The Press Eccentric is of best cast steel, fitted with "Lowmoor" cold blast iron straps; and the smaller eccentric operates the automatic feeder by means of which the output of the Re-press is considerably increased.

The crosshead works in large adjustable V slides, and the die (made in two parts and secured by massive steel bolts for convenience in handling) is lined with special "Ubas" steel plates of great durability, which are easily renewable when worn.

The type of Gearing may be machine-cut straight spur, or machine-moulded double helical, as preferred.

All the parts of the Re-press are strong, well proportioned and truly machined, enabling a very heavy pressure to be brought to bear on the bricks with most satisfactory results.

Weight for Shipment	-	-	-	6 $\frac{1}{4}$ Tons.
Floor Space	-	-	-	6' 8" x 6' 0" x 9' 0" high.
Brake Horse Power required	-	-	-	6.



Craven's Patent Tile and Quarry Press.

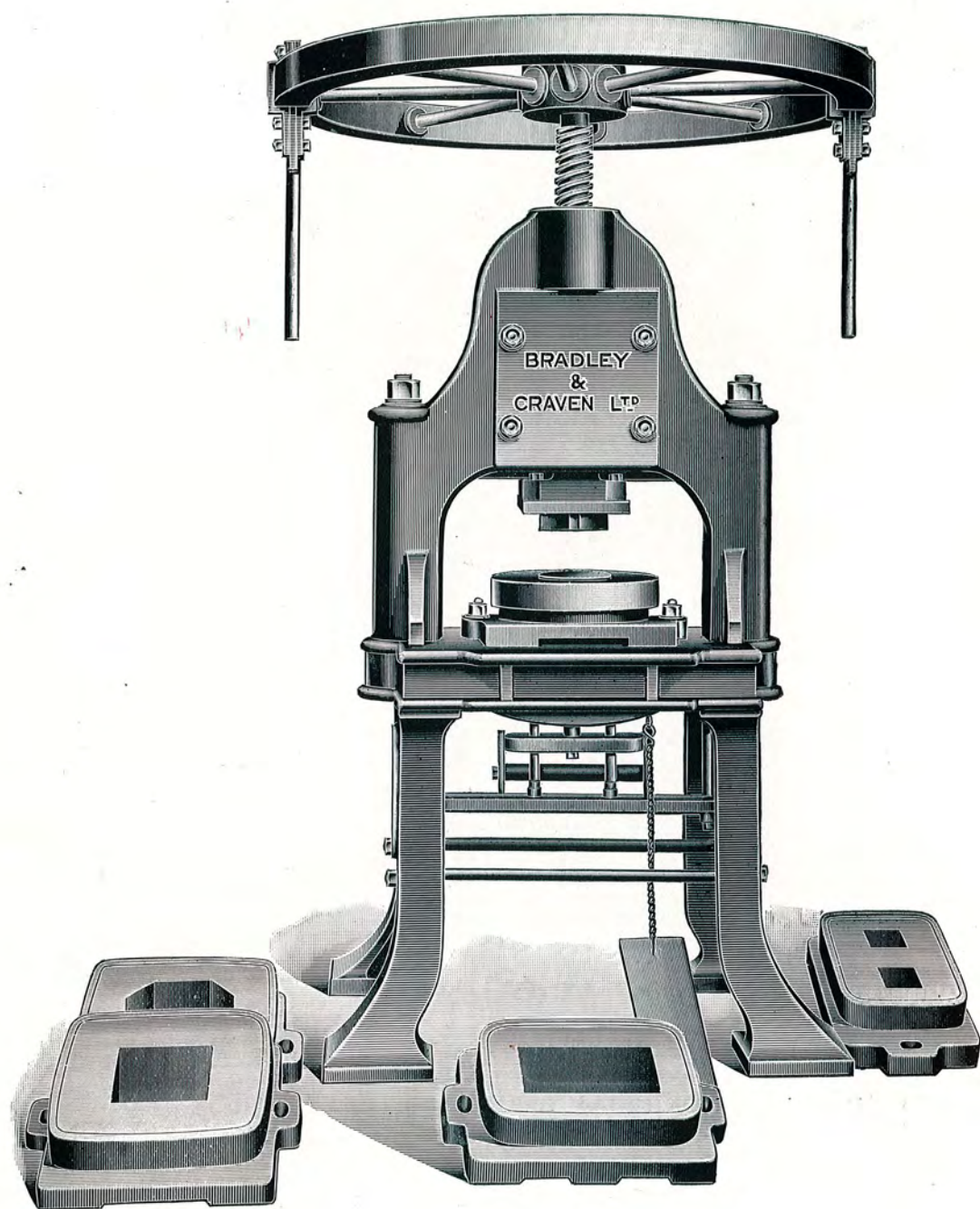
THE illustration opposite represents our improved Power Press, which we have designed for dealing with tiles and fireclay quarries above the normal size, being suitable for pressing these goods up to 2ft. square.

The Press is self-contained on a massive cast iron bed plate, and the standards are firmly braced together by steel rods through cast iron distance pieces. The Pressing Shaft is of hammered high-carbon steel 7in. diameter, machined all over and supported in gunmetal-bushed pedestals of extra large area. On this shaft is fitted the cast steel Eccentric working in "Lowmoor" cold blast iron straps, to which is attached a stamper rod of best forged steel. The Crosshead works in large "V" slides which, being adjustable, prevent it getting out of truth with the die and ensuring accurate work. The gearing of large ratio may be either of the machine-moulded double-helical or machine-cut straight spur type, as preferred, and is practically noiseless when working. Cast iron fast and loose driving pulleys of strong design are fitted, and the loose pulley is provided with a renewable gunmetal bush.

Our improved Roller Key Clutch is embodied in this Press, for the purpose of positively stopping the pressing shaft at the top of each stroke to allow the attendant whatever time is required to carefully place in and remove the tiles or quarries from the die. The pressing shaft cannot commence its downward stroke until the foot lever is depressed, which avoids any risk of injury to the attendant.

These Presses have been adopted by several of the largest makers of special fireclay goods in this country, and are giving unqualified satisfaction.

Weight for Shipment	-	-	-	6 Tons.
Floor Space	-	-	-	5' 1" x 7' 0" x 9' 8" high.
Brake Horse Power required	-	-	-	6.



Hand Screw Brick and Tile Press.

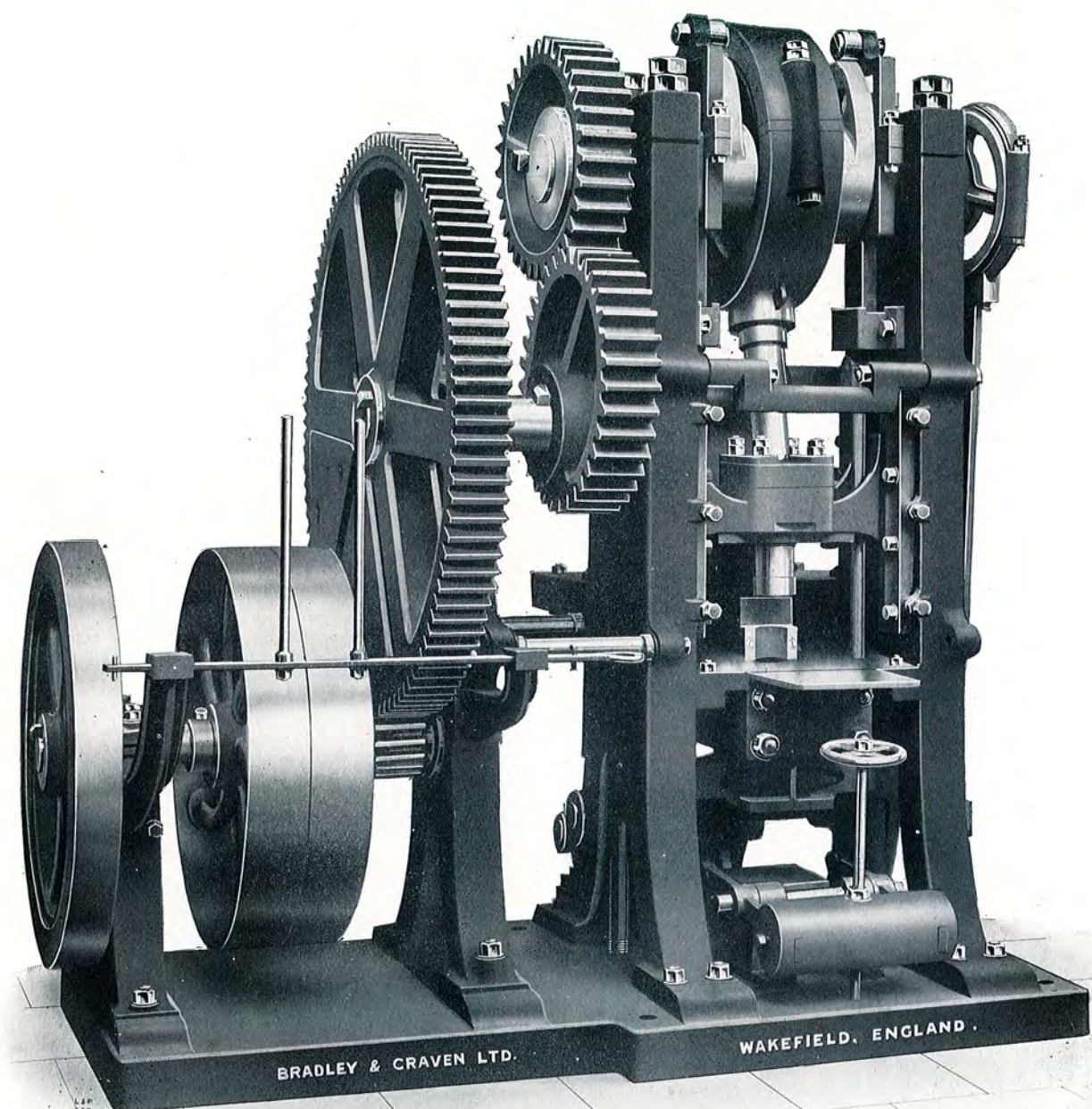
THE opposite illustration represents our Improved Screw Press for the production of plain and ornamental bricks and tiles, garden edging, etc.

This Press is substantially built and particular attention has been given to the depth and adjustment of the pressing head to ensure accurate work. The Screw is cut from a special hard quality of steel, and the nuts in which it works are of phosphor bronze.

The square die is fitted with "Ubas" steel linings which are carefully hardened, and improved lifting and drop motions are fitted which greatly facilitate the operations of pressing.

The Press can be fitted either with ball lever or hand wheel, as preferred.

Weight for Shipment	-	- 30 cwts.
Floor Space	-	- 4' 3" x 4' 3" x 6' 6" high.



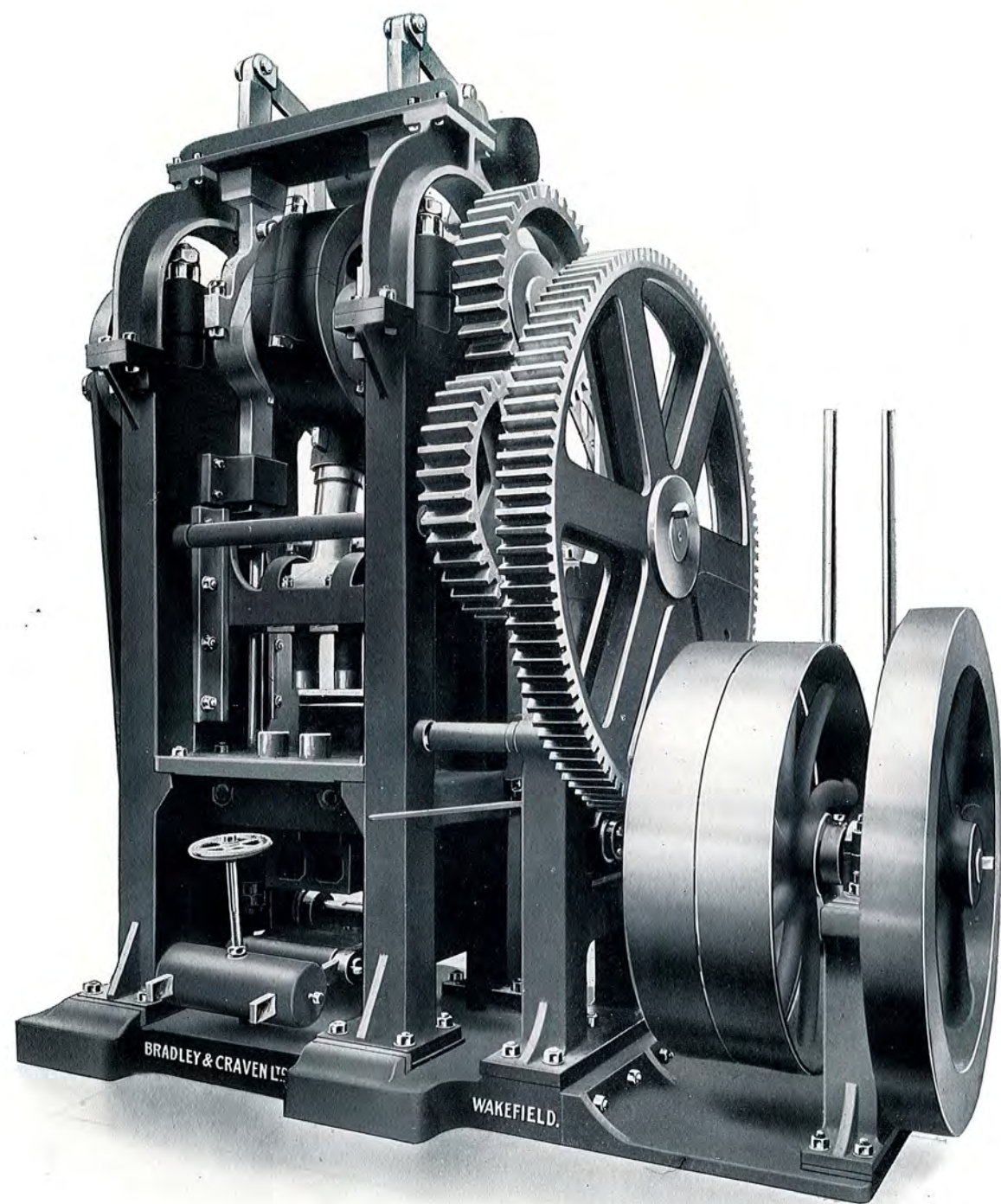
Craven's Patent Press

for producing

Carbide Cakes, Blocks, Briquettes, Tiles, etc.
(Single Die).

THE PRESS, as per annexed illustration, is exactly similar in principle and action to that on the following page with the exception that it is fitted with single instead of double die, and proportionately reduced in general dimensions for lighter duty.

Weight of Machine for Shipment	-	-	-	10 $\frac{3}{4}$ Tons.
Floor Space occupied	-	-	-	7' 10" $\times$ 7' 6" $\times$ 11' 0" high.
Approximate Brake Horse Power required	-	-	-	10.



Craven's Patent Press

for producing

Carbide Cakes, Blocks, Briquettes, Tiles, etc.
(Double Die).

THE machine as illustrated has been designed to produce blocks, briquettes, tiles, etc., and a number are at present working on the production of carbide of calcium cakes for acetylene gas manufacture, giving great satisfaction.

The machine is mounted on a strong baseplate on which the housings or standards are firmly secured.

In operation the feed shoot at the back is charged with the material to be used, and a sliding box comes directly under it thus receiving a charge, it then passes over the die (which can be made any desired shape and size) depositing its contents, and is brought back by the operating levers; the crosshead descends on the evenly filled die, and the eccentric motion by which it is worked exerts a heavy pressure on the material, producing a densely formed article. Two suitable cams acting on rollers attached to guide rods lift up the lower piston in the die and eject the newly made articles; the sliding box then brings another charge of raw material, and in so doing pushes off the finished product ready for removal by the attendant. The pressing shaft is driven by double gearing, the first being machine-cut, consisting of steel pinion and strong cast-iron wheel; the second motion is a pair of steel wheels of elliptical pattern in order to obtain variable ratio of gear, the largest ratio being in mesh when the heaviest pressure is exerted. Another advantage of this type of gearing is that the crosshead descends slowly on the material allowing for the escape of air confined in the charge and prevents lamination in the article produced.

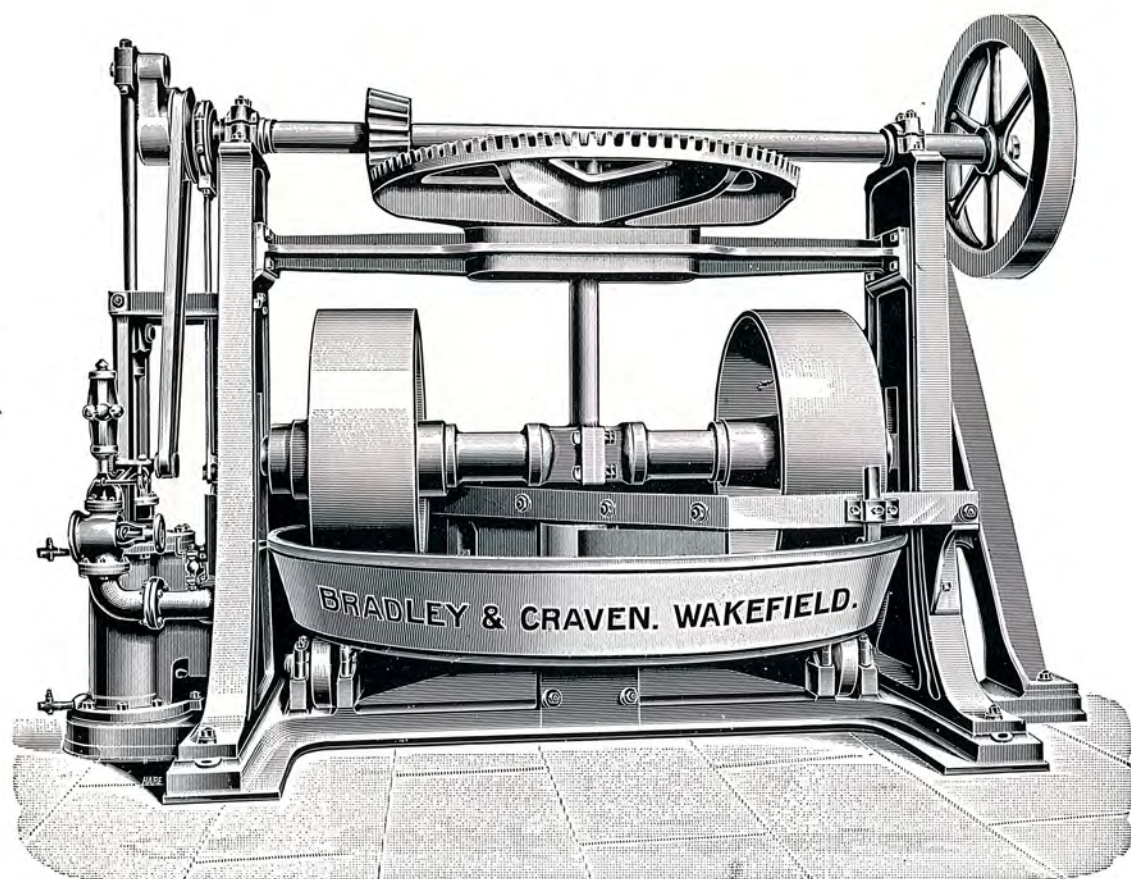
The machine is provided with fast and loose driving pulleys and a heavy fly-wheel.

The die is lined with casehardened steel and the pistons are fitted with renewable heads of similar material.

The pressing shaft is $8\frac{1}{2}$ in. diameter and the holding-down bolts are of Best Yorkshire Iron $3\frac{1}{4}$ in. diameter.

It will be found a very useful machine for making dust tiles and briquettes of various sizes.

Weight of Machine for Shipment	-	-	13 $\frac{1}{4}$ Tons.
Floor Space occupied	-	-	8' 6" x 7' 6" x 11' 0" high.
Approximate Brake Horse Power required	-	-	12.



Improved Mortar Mill with Engine Combined.

THE illustration opposite represents our Improved Mortar Mill with Engine attached. Every part of this Machine is truly planed and fitted, ensuring great rigidity and efficiency, thus adapting it for treating the roughest kind of material.

The Rollers are fitted with our special hard iron hoops which can be easily renewed when worn; the 9ft. diameter Mill has rollers 4ft. 10in. diameter over all by 18in. wide, hoops being $3\frac{1}{4}$ in. thick. Weight of each roller and hoop about 55 cwts.

The Mills above 7ft. diameter are provided with turned supporting rollers, working in gun-metal bushed bearings.

The Cylinder of the Engine is made from special hard iron; and the admission of steam is regulated by a "Pickering" Governor.

The Gearing is of massive design, the wheel being of a mixture of West Coast Hæmatite, and pinion of "Lowmoor" cold blast iron, and all wearing parts are easily accessible.

All bearings are of extra large area, bushed with gunmetal, and the vertical shaft is supported in a massive footstep fitted with phosphor bronze plate.

These mills are made in four sizes, 6ft., 7ft., 8ft., and 9ft. diameter.

Weight of 9ft. Mill and Engine for Shipment	-	25 Tons approximate.
Floor Space	- - -	16' 4" x 8' 6" x 12' 1" high.
Diameter of Cylinder for 9ft. Mill	-	14"
Stroke	- - -	20"
Bore of Steam Inlet	- - -	$3\frac{1}{2}$ "



Steam Sanitary Pipe-Making Machine.

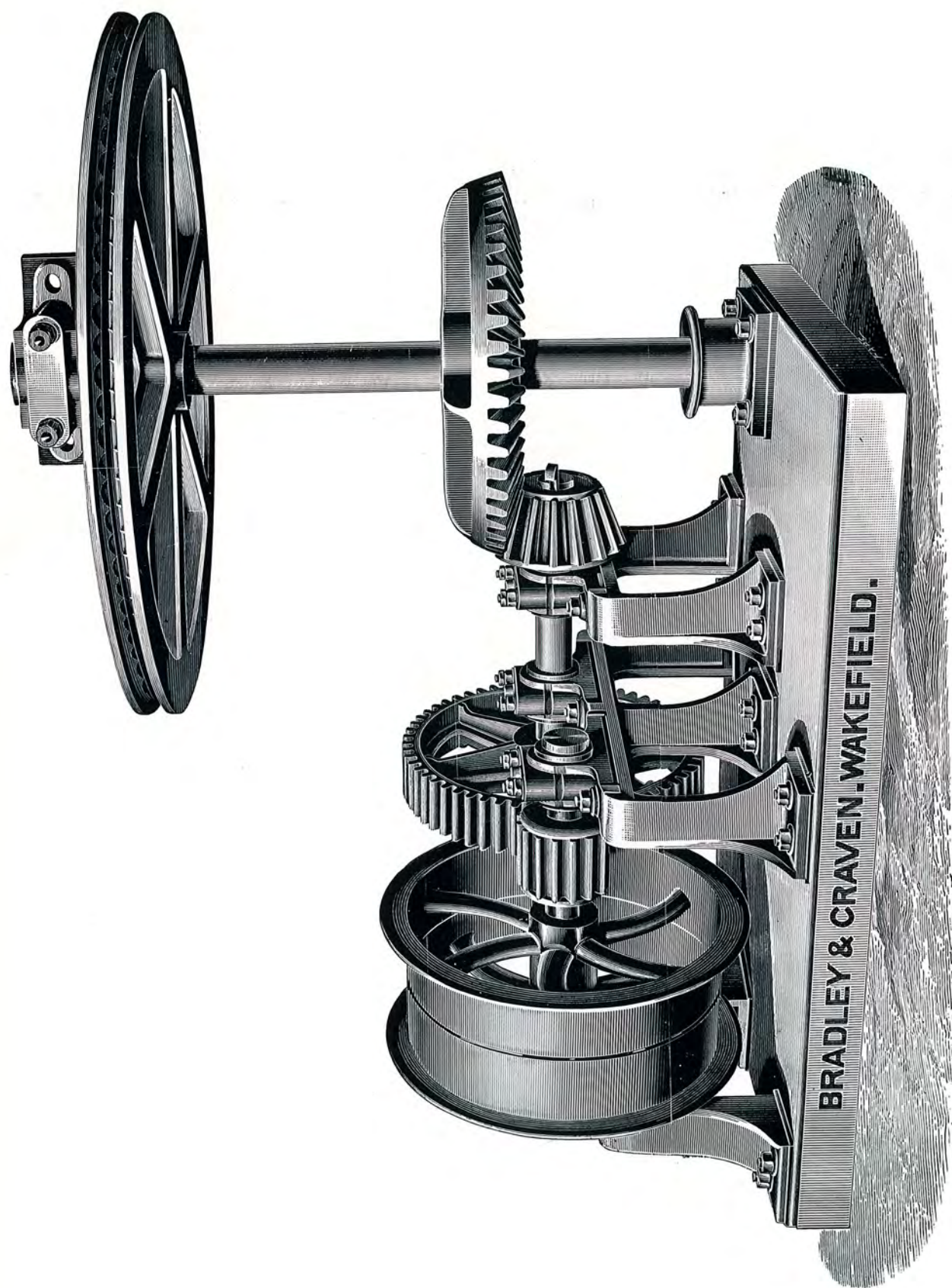
THE Machine illustrated on the opposite page possesses the merit of extreme simplicity, the steam acting directly in pressing the clay into and through the dies which form the socket and pipe.

The engraving will render intelligible the construction of the machine. The steam and clay cylinders are at the top and bottom respectively of an intermediate frame or standards which rest on the supporting girders; the clay piston is attached to the steam piston by three steel rods and forces the clay into the dies which form the socket and pipe. These are fixed to the bottom of the clay cylinder; the longer hand lever operates the steam valve, and the shorter one the locking gear, holding the socket head or ring in position during the operation of forming the socket.

The mode of working is as follows: the clay is placed on the upper or charging floor (level with the top of supporting girders), and from thence between the two side openings in the standard it is charged into the lower cylinder. When the clay cylinder is filled, the clay piston descends into it upon the steam valve being opened, pressing the clay into the socketting die, which is fitted with improved air valves for the release of the air confined in the die. The socket head is "locked up" to the die during the forming of the socket by means of two powerful horizontal-levers shewn at the foot of the machine actuating the vertical rod, and these work on ball bearings in order to reduce the friction to a minimum. The socket portion of the pipe being formed, the horizontal levers are released and the socket head, which is attached to the balanced receiving table, descends and the body portion of the pipe is pressed through the die and carried down with the receiving table, the travel of which can be regulated to suit the length of pipe to be made. The vertical movement of the table is guided by the truly fitting crossbar working up and down the turned pillars which connect the dies and receiving table together.

Attached to the die is a cutter, arranged to cut off the pipe when the required length has been made, after which it is removed to undergo the finishing processes.

These Machines are made of various sizes for pipes from 3" to 36" diameter.



Endless Chain Hauling Gear.

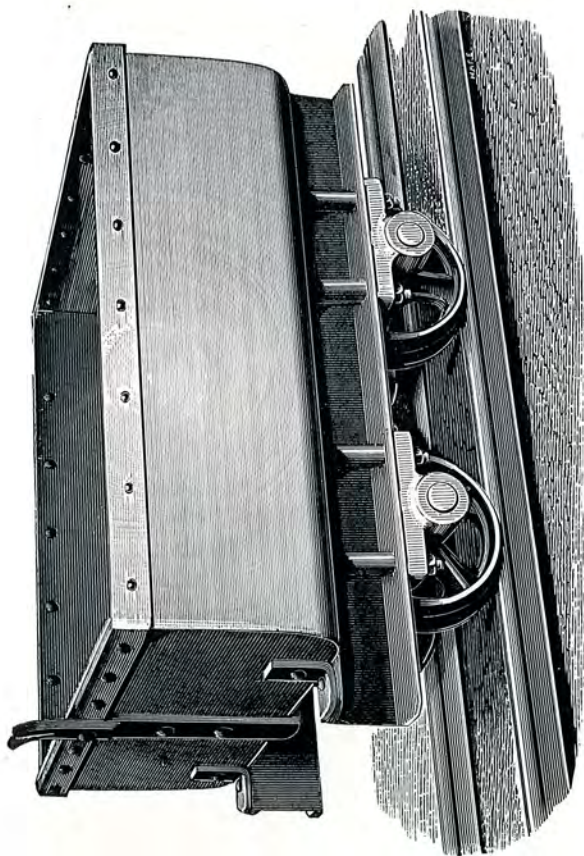
THE illustration opposite represents our Endless Chain Hauling Gear, which greatly facilitates the hauling up of clay from the pit, and takes very little power to drive.

The top vertical shaft and gearing are mounted on a strong cast iron frame which occupies but small space.

The spur and bevel gear is of large ratio and the chain wheels are of improved design giving grip to the chain, and non-slipping under the heaviest load.

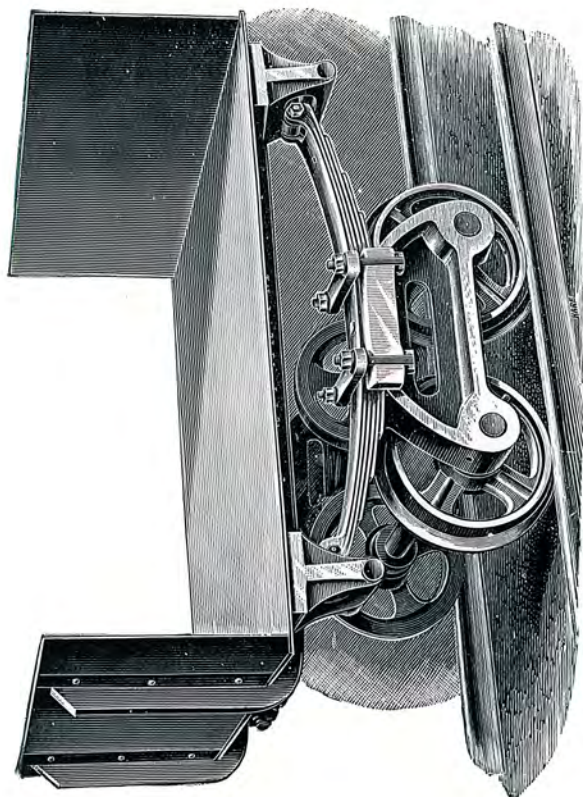
The bottom pulley (which is not shewn in illustration) is carried by a shaft running in vertical bearings, fixed on strong base plate which can be bodily moved when required.

Weight for Shipment 3 Tons.



Clay Truck.

THE above represents our standard size of Clay Trucks which are very convenient for handling. The bottom and sides are made in one piece, and the ends are securely fastened. They are mounted on steel channel frames, and fitted with wheels cast on specially made hard steel axles running in bored loops, so that the wear and tear is reduced to a minimum.



Brick Truck.

FOR easily and economically removing the bricks into the Kiln, these trucks are very useful. The bottom and ends are of mild steel, suspended on Springs. The axles are of hard steel, fitted with bored wheels, and carried in machined cast iron loops having extra large bearing surface. A minimum of effort is required for propulsion.

Continuous Kilns.

WE had the privilege of introducing into this country the well-known "Hoffman's" Continuous Kiln, and having worked them for upwards of fifty years, we are enabled by long practical experience to supply drawings of the most up-to-date and improved forms of Kilns working on this principle, and give expert advice in connection therewith.

The great success attained by the employment of these Kilns is universally acknowledged, and by our recent improvements they burn a very superior class of brick at a minimum cost for fuel.

Exceptionally favourable terms for complete working drawings are offered to purchasers of our Brick Making Plant.

Price and Terms on application.

Results of Experiments

To ascertain the RESISTANCE to a gradually increased THRUSTING STRESS
OF SIX BRICKS

MADE BY

CRAVEN'S PATENT BRICK-MAKING MACHINES.

TEST No.	DESCRIPTION.	MARKED.	DIMENSIONS INCHES.	BASE AREA. SQUARE INCHES.	STRESS IN POUNDS, WHEN	
					CRACKED SLIGHTLY.	CRUSHED.
3373	RED BRICKS (recessed both sides)	"D"	3'05 × 8'70 × 4' 11	35'76	284,200	400,500
3371		"B"	3'03 × 8'70 × 4'13	35'93	323,400	395,100
3372		"C"	3'06 × 8'74 × 4'18	36'53	322,200	370,100
3370		"A"	3'02 × 8'64 × 4'05	34'99	267,500	364,200
3374		"E"	3'05 × 8'76 × 4'14	36'27	261,900	359,200
3375		"F"	3'08 × 8'86 × 4'20	37'21	313,300	344,400
Mean				36'11	295,417	372,250
Lbs. per square inch				..	8,181	10,308
Tons per square foot				...	526'1	662'9

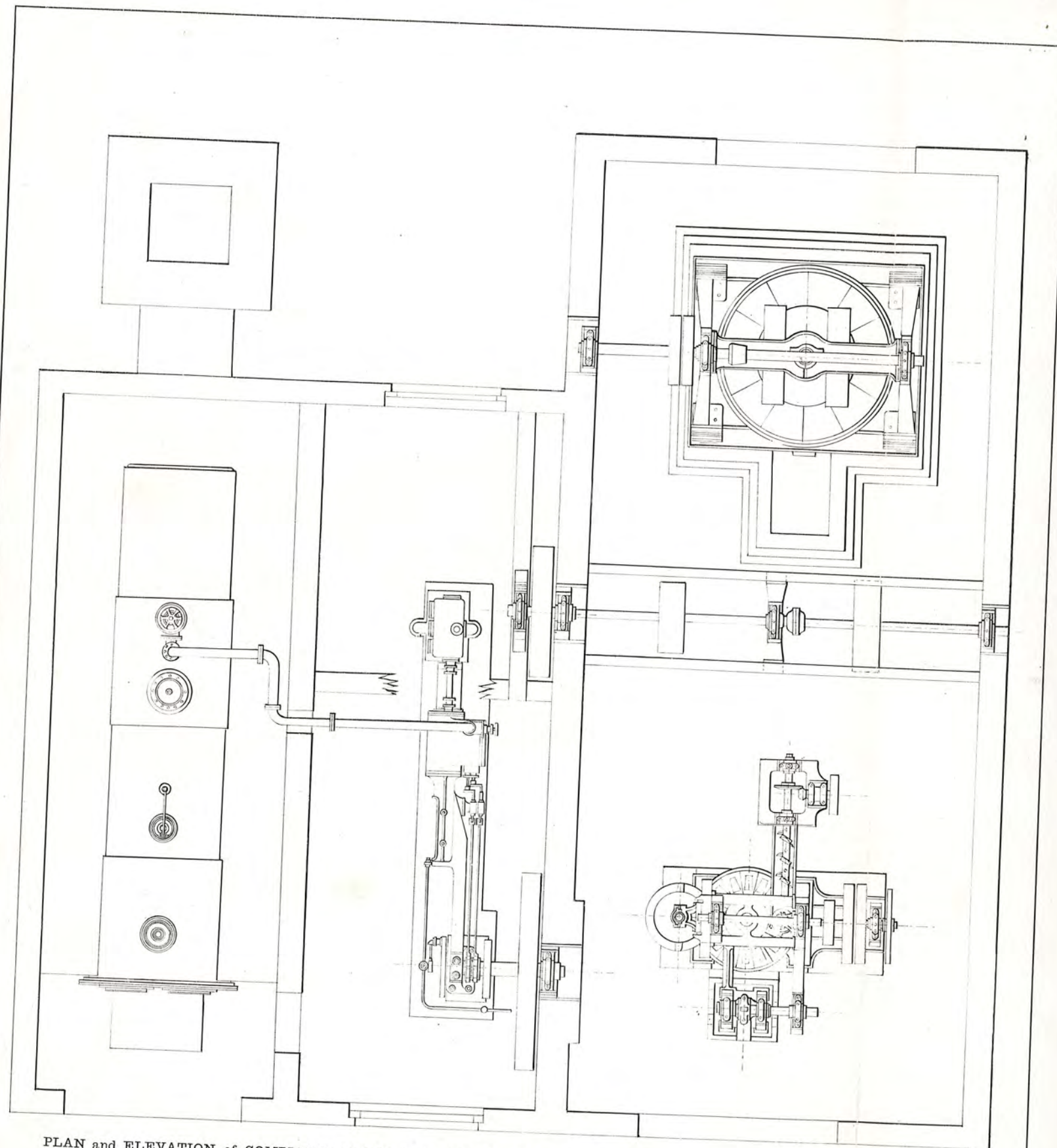
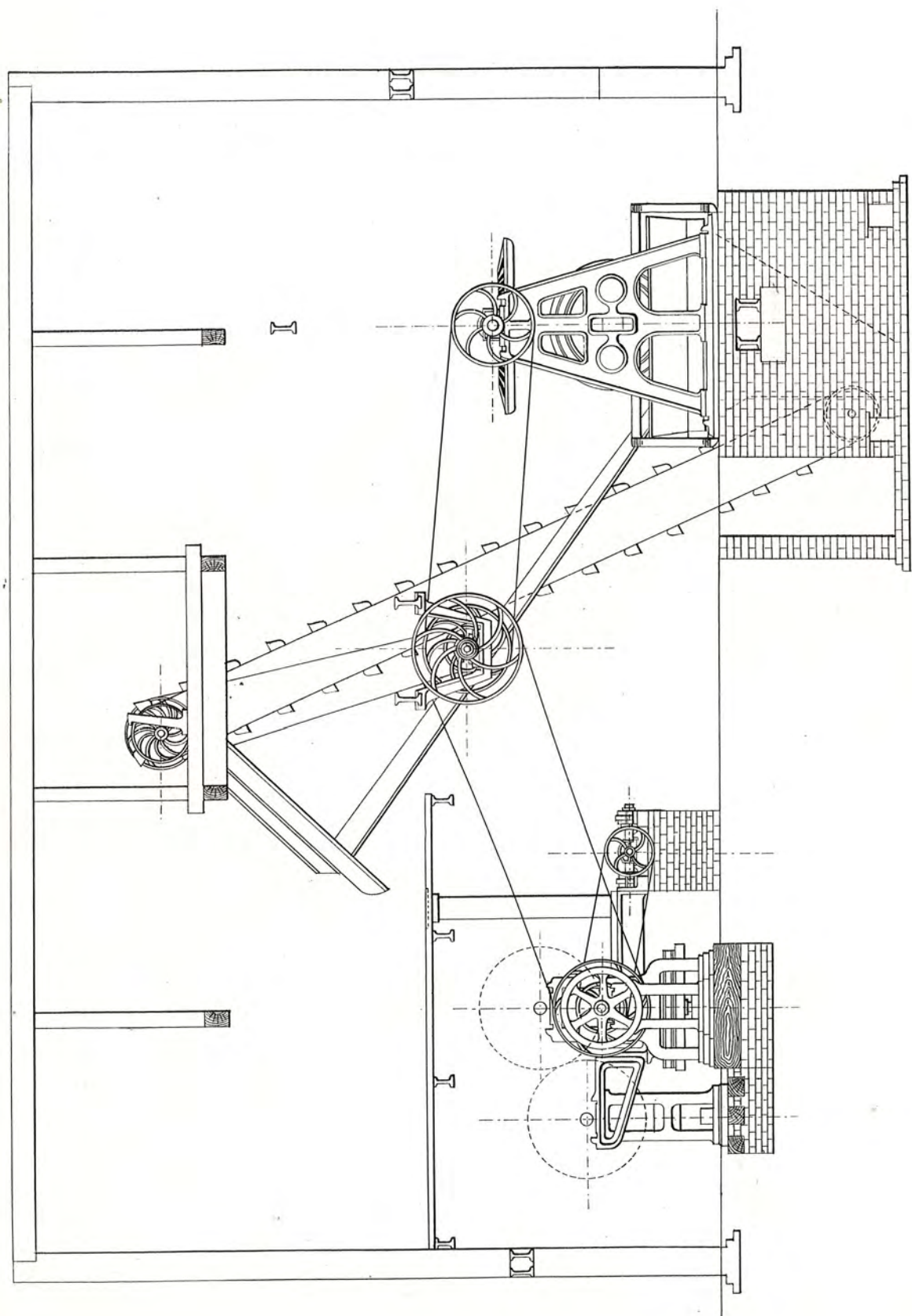
Recesses filled with Cement.

POROSITY OF THREE BRICKS.

TEST No.	DESCRIPTION.		BEFORE IMMERSION.	24 HOURS AFTER IMMERSION.	DIFFERENCE.	ABSORPTION.
			LBS.	LBS.		PER CENT.
3376	As above	"G"	8'902	9'314	'412	4'63
3377		"H"	8'933	9'428	'495	5'54
3378		"K"	8'794	9'315	'521	5'92

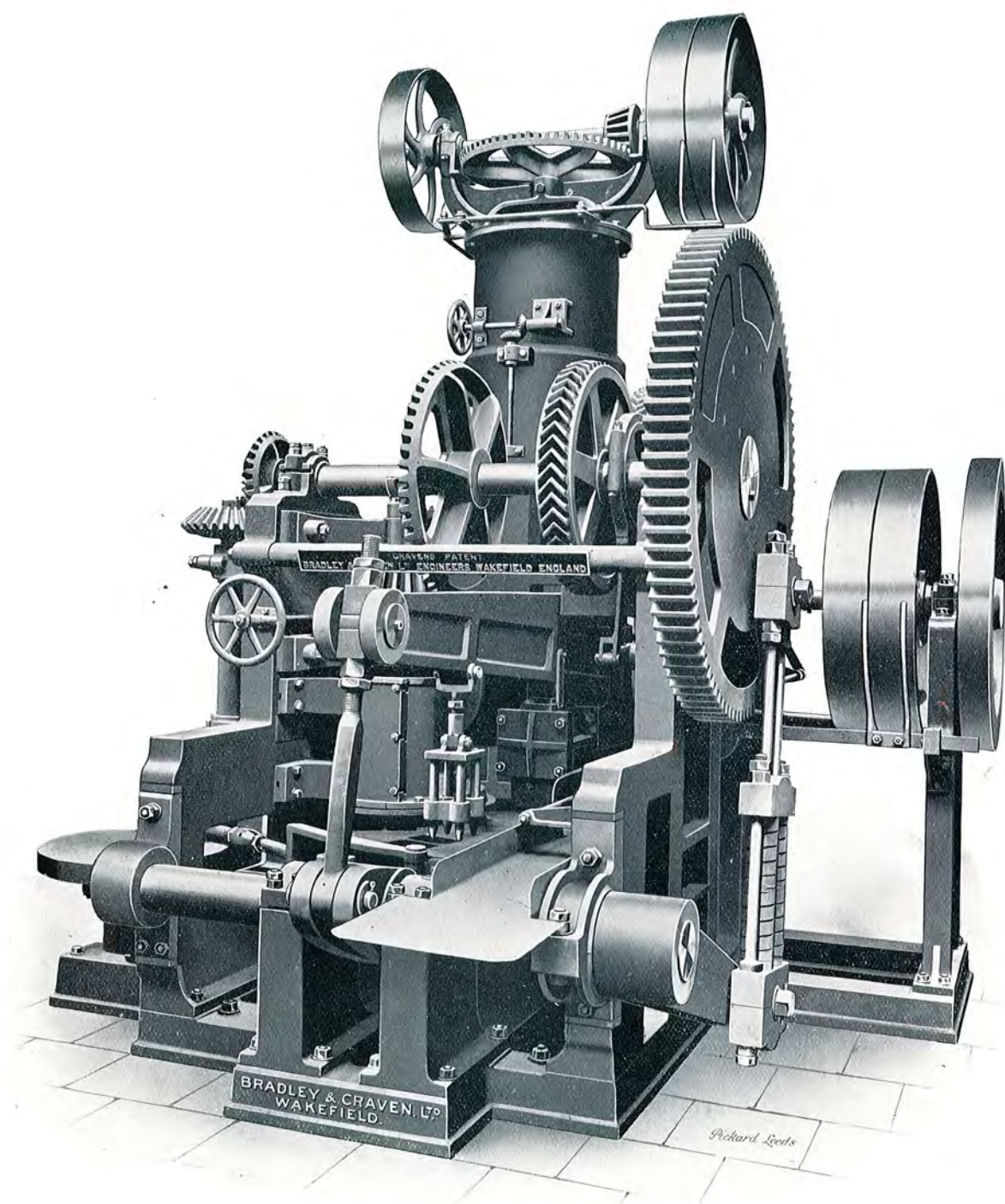
DAVID KIRKALDY & SON.

18th July, 1912.



PLAN and ELEVATION of COMPLETE "STIFF-PLASTIC" BRICK-MAKING PLANT for an output of 10/12,000 bricks per day of 10 hours consisting of--1 High-Pressure Lancashire Boiler and Fittings; 1 High-Pressure Condensing Steam Engine, Cylinder 13in. dia. by 26in. stroke; Main Line Driving Shafting with Pulleys and Pedestals; 1 9ft. dia. "Open-Base" Clay Grinding Mill and Elevators; and 1 Craven's Patent No. 1 Brick-Making Machine with Single Mixer.

Brique Machine.



Coal Briquette Machine.

(Craven's Patent).

THE Patentees of the Machine illustrated on the annexed page have had large experience with this class of machinery (both of their own make and that of other Patentees'), and the one now presented embodies the improvements gained by their wide experience.

A great difficulty arises in some Machines when producing a number of briquettes simultaneously, in filling all the compartments of each mould with an equal quantity of material to be briquetted, and one of the cardinal points in the Machine now illustrated is that by our unique system we overcome this trouble whether the mould comprises one or a multiple number of compartments; they therefore all receive the same amount of pressure, preventing undue strain.

The Machine comprises large vertical heater, charging cylinder fitted with propellers, revolving table and powerful steel compressing levers.

The vertical heater is steam-jacketted, fitted with internal shaft, steel knives and inlet pipes for steam, regulating gear for controlling the supply of material from heater to charging cylinder, and fast and loose driving pulleys.

The materials for briquetting—fine coal and pitch or other agglomerant—are thoroughly amalgamated in the vertical heater; they then pass out into the charging cylinder, wherein is working a vertical shaft fitted with blades or knives, for agitating and forcing the materials into the moulds of the revolving table, and which expel all air confined between the particles.

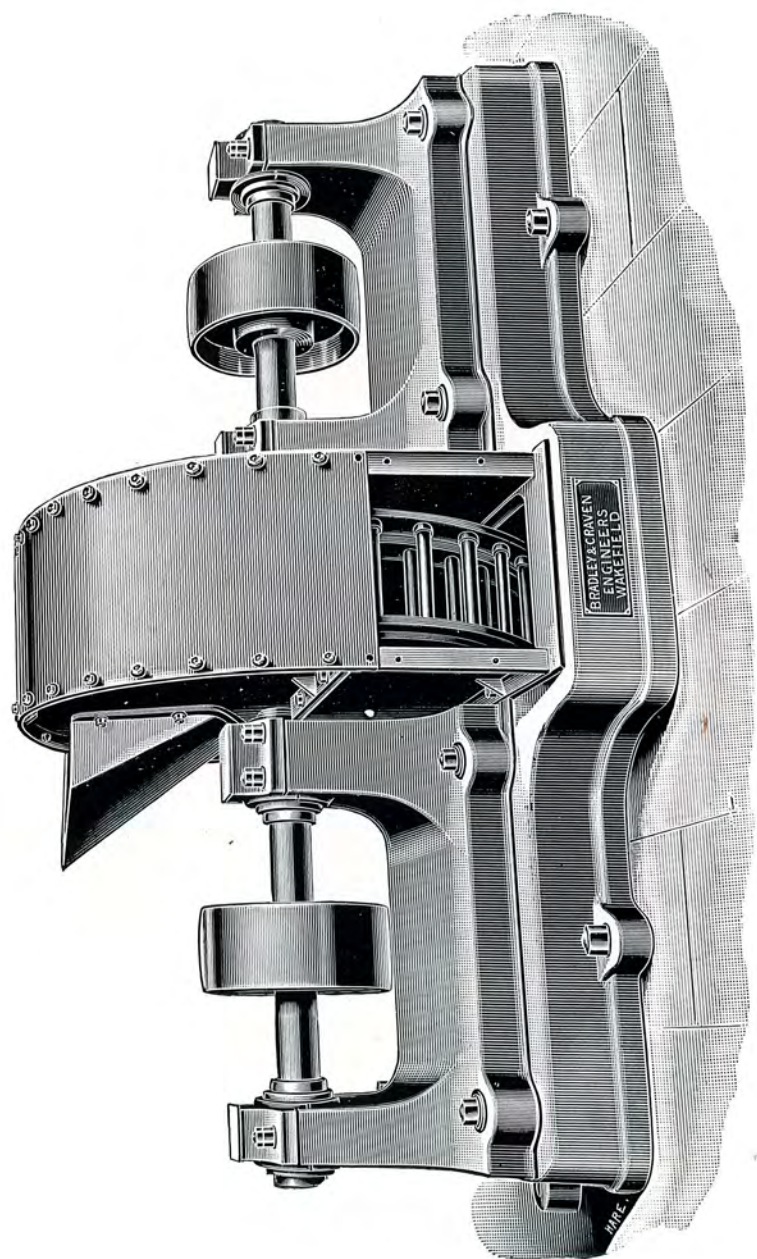
After receiving the charge of material the table makes a partial rotation until the newly filled mould comes under the compressing pistons; these pistons are actuated by powerful steel levers which exert a pressure equal to 3 to 4 tons per square inch. The pressure exerted by these levers can be adjusted at will, and they are provided with hydraulic relief and gauge to prevent breakage by "over-pressure."

The densely pressed briquettes, by another partial movement of the table, are ejected from the moulds and automatically passed on to a creeper belt to be conveyed to any desired position for loading.

These Machines are also being largely used for compressing iron, nickel, and other kinds of ore. The process of manufacture is similar to that of coal briquettes, the only variation being that pitch is substituted by clay wash or other suitable agglomerant, and in such cases the vertical heater is dispensed with.

We make these Machines in various sizes:—for outputs ranging from 25 to 150 tons of briquettes per day of ten hours. The weight and size of the briquettes can be varied within wide limits.

Prices and Specifications on application.



“Carr” Type Disintegrator.

THIS Illustration represents our “Carr” Type Disintegrator, for grinding Coal, Coke, Gypsum, Charcoal, Steamed Bones, Salt, Slate, and other medium hard materials. It is specially adapted for working in conjunction with our “Craven’s” Patent Briquette Making Machine for reducing the materials to a fine powder.

The Machine is mounted on a strong cast iron bedplate of box section, to which are bolted four massive headstocks fitted with phosphor bronze bushes of large area, for carrying the forged steel spindles, or shafts. Cold Blast Iron Discs are firmly keyed on, to which are fixed a series of steel rings and beaters, and these fitted to work within each other are rotated in opposite directions at a high rate of speed, the centrifugal force and the action of the beaters reducing the materials to a fine powder.

The Rings and Beaters are made of specially hardened steel, ensuring great durability.

A mild steel dust cover encloses the cages, to the side of which the feed hopper is attached; this cover is easily removable.

These Machines are made in four sizes:—

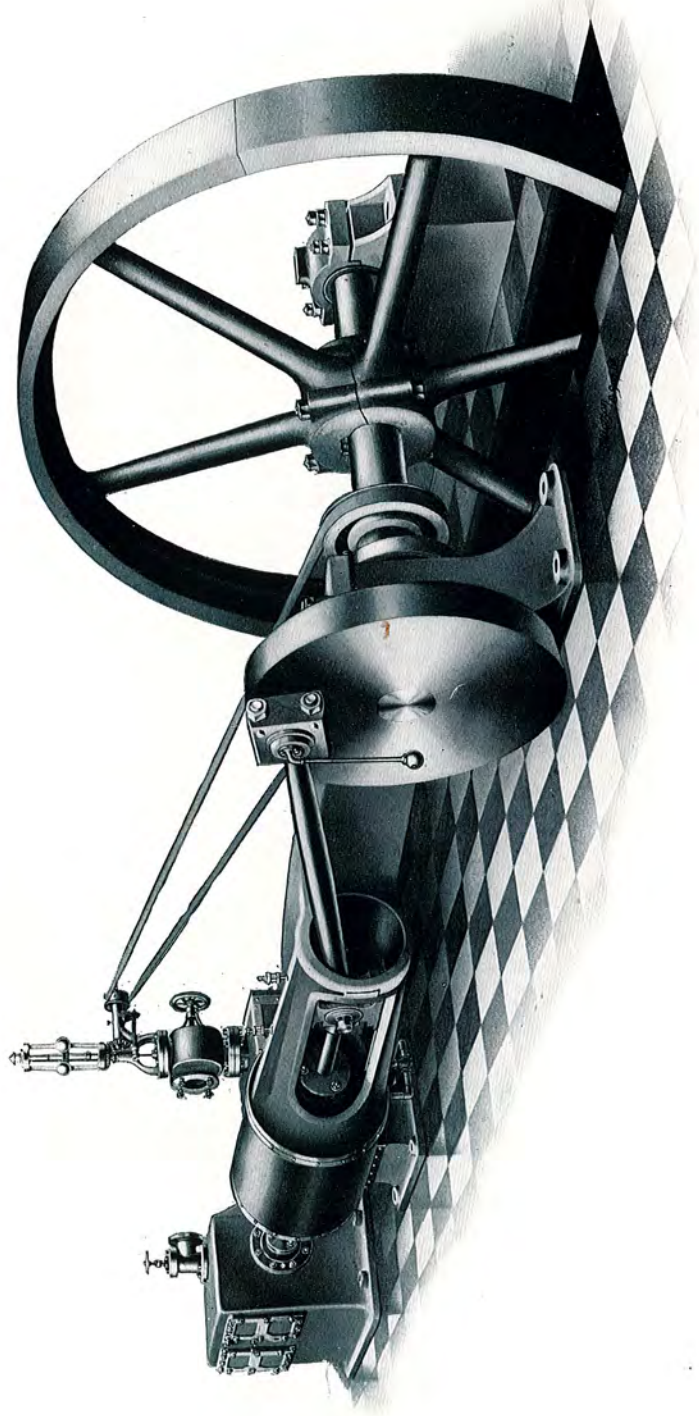
	Diameter of outer cage 3ft. 6in.; 4ft. 0in.; 4ft. 6in.; 5ft. 0in.			
Approximate Brake Horse Power required	 12	15	20	24
Approximate output per hour, varying according to nature of material	 cwt. 120	180	300	360

Steam Engines.

THE department of our business devoted to the manufacture of Steam Engines has been considerably extended of late years, we having adopted the best and most up-to-date labour-saving machine tools in order to expedite and reduce the cost of production.

The following pages illustrate only a few examples of the character of our Engines, but we build them for almost all kinds of stationary duty, and of the single, side-by-side and tandem types, according to requirements, and with various types of valve gear—Cornish Double Beat, Corliss, and a combination of Corliss and Drop Valves, all of which are controlled by efficient governor and fitted with trip gear for securing utmost economy in steam. When the Engines are provided with Condenser, this may be actuated direct by piston rod prolonged through the cylinder back cover or by “L” levers.

Colliery Winding Engines have received our close study for many years, and a large number constructed at these works over fifty years ago are still working and giving every satisfaction, notwithstanding the increased loads and more severe duty imposed at the present day. Our facilities are equal to all demands, we having received and executed orders for Engines with Corliss cylinders 45 in. diameter by 7 ft. 6 in. stroke, and Winding Drums both cylindrical and conical types of the largest dimensions.



High-Pressure Horizontal Condensing Steam Engine.

THE illustration opposite represents one of our Standard Pattern Horizontal Condensing Engines with Corliss frame.

This Engine is of strong construction, and all wearing surfaces are of large area.

The working barrel is a separate casting tightly pressed into the cylinder, and is made from a special mixture of hard iron.

The cylinder is lagged with planished sheets and polished steel bands, and the general finish throughout is of the highest class.

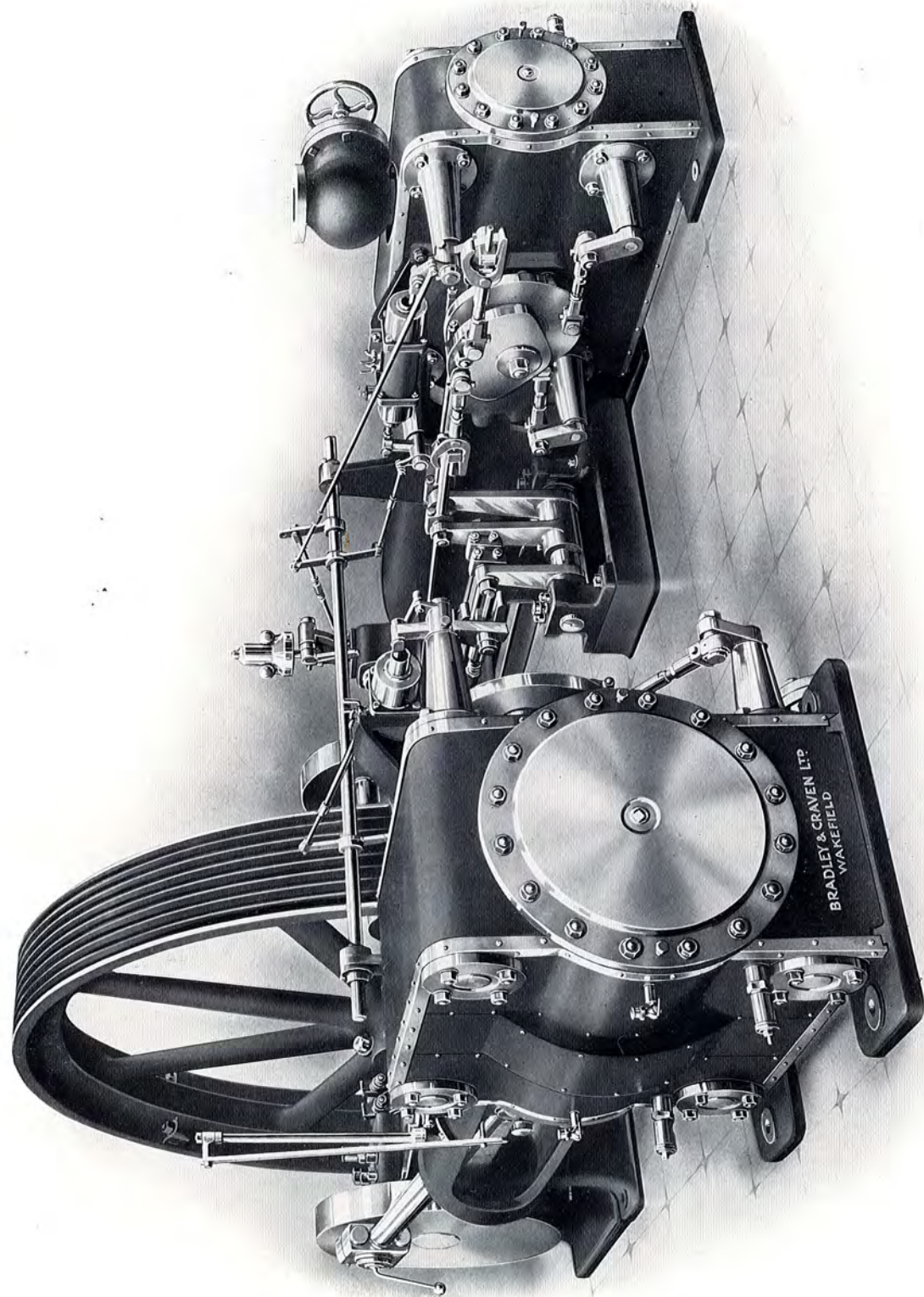
The admission of steam is through short double-ported valves, controlled by our improved high-speed Governor of the "Pickering" type. For high pressures we recommend either double-beat or Corliss valves.

The bearings are of gun metal of ample area, and truly machined.

The piston is of cast iron and fitted with improved anti-friction metal rings expanded by steel springs or other approved method.

The fly-wheel is cast in halves for convenience in handling, and is machined on face for belt driving. We also make them to suit rope driving at a small extra cost.

Great attention is given to proper lubrication of all working parts, including automatic sight feed lubricator to the cylinder.



High Pressure Horizontal Coupled Compound Corliss Engine.

THE illustration opposite shews an example of one of our High Pressure Horizontal Compound Engines especially adapted for large Industrial Works.

The Cylinders, 14 in. and 24 in. diameters by 36 in. stroke, are cast from a special mixture of iron of great durability, and fitted with Corliss Valves controlled by improved Trip Gear actuated by high-speed governors driven by "Renold" Silent chain and wheels.

The Valve Seats are lined with sleeves of extremely hard iron, and the Valves also are of close-grained metal.

The Main Pedestals are of massive design, fitted with four-part square-backed gunmetal bushes of large area, adjustable by means of taper wedge bolts.

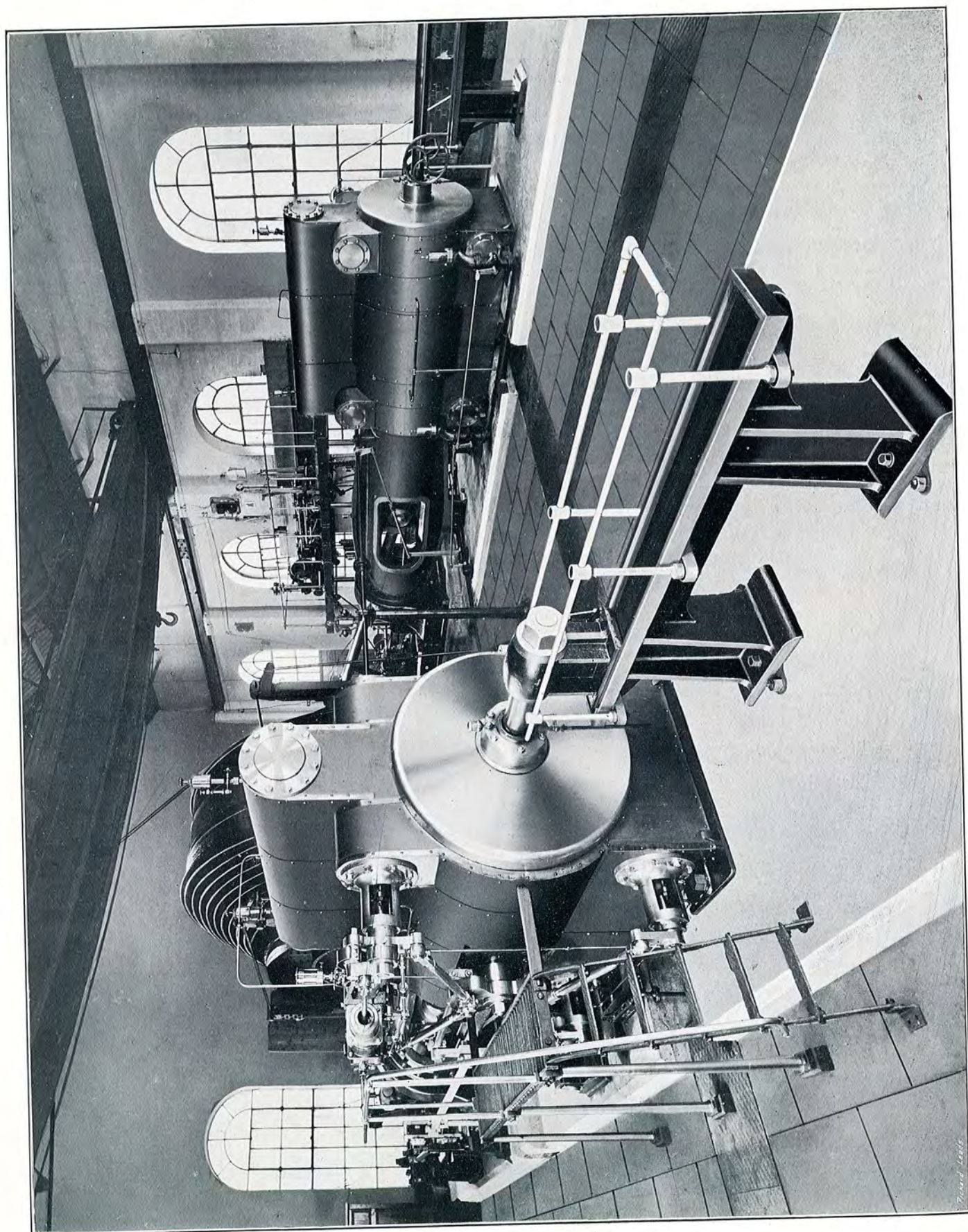
The Crank Shaft and Connecting Rods are forged from Admiralty quality steel machined all over and polished.

The Crossheads are of cast steel, fitted with adjustable slippers of large dimensions.

The Fly-wheel is cast in halves, planed at the joint, securely bolted together, and nine grooves turned in face for $1\frac{1}{2}$ in. diameter ropes.

The Engine is so arranged that a horizontal double-acting Condenser may be placed behind the low pressure cylinder, the piston rod being prolonged to couple up to a pump rod of "Muntz," "Delta" or other approved metal.

Prices and Specifications on application.



Horizontal Winding Engines.

"Corliss" Type, with Conical Drum.

THE illustration opposite represents a pair of powerful Winding Engines we recently made and supplied to a large Colliery in Yorkshire, the same Colliery having had Engines of our make running for a period of over 40 years.

The bed plates are of strong box section, $18\frac{1}{2}$ " deep by $15\frac{1}{2}$ " wide, machined on the underside for truly bedding on masonry and also for main pedestal, the circular end is faced for receiving the trunk slide which is firmly bolted to it.

The Cylinders are steam-jacketted, 42" diameter and 7' 0" stroke; the liners of specially hard metal are forced in by hydraulic pressure.

The Valve Boxes are bored out and fitted with hard metal liners, reducing friction on the valves to a minimum.

The Pistons are metallic with cast-iron rings and internal springs of the Mather & Platt type.

The Piston Rods are of high-carbon steel 7" diameter with conical swell in the centre for receiving the piston. The rods are supported at the back-end by large slippers working in single slides. The glands are fitted with "United States" Metallic Packings..

The Crank Shaft is of Admiralty quality steel, carefully annealed after forging, and is 20" diameter in the body, having bearings 19" diameter by 28" long.

The Cranks are made from mild steel forgings, suitably annealed, machined all over, shrunk on shaft and further secured by steel keys. The Crank Pins are of nickel steel 10" diameter by 12" long.

The valve gear and link motion are made of best mild steel, machined and polished all over. The valves are operated from the wrist plates and the trip gear is controlled by a high speed governor cutting off the steam according to the varying loads. All joint pins are of best hardened steel.

The Winding Drum is constructed on three bosses and is of conical shape, the small diameter is 16', increasing to 26'; brake rims are provided at each side, and these are 16' diameter by 9" wide; the parallel part of drum is covered with steel plates supported on a truly turned cast steel ring and steel T's bent to shape, and the whole firmly braced and rivetted together.

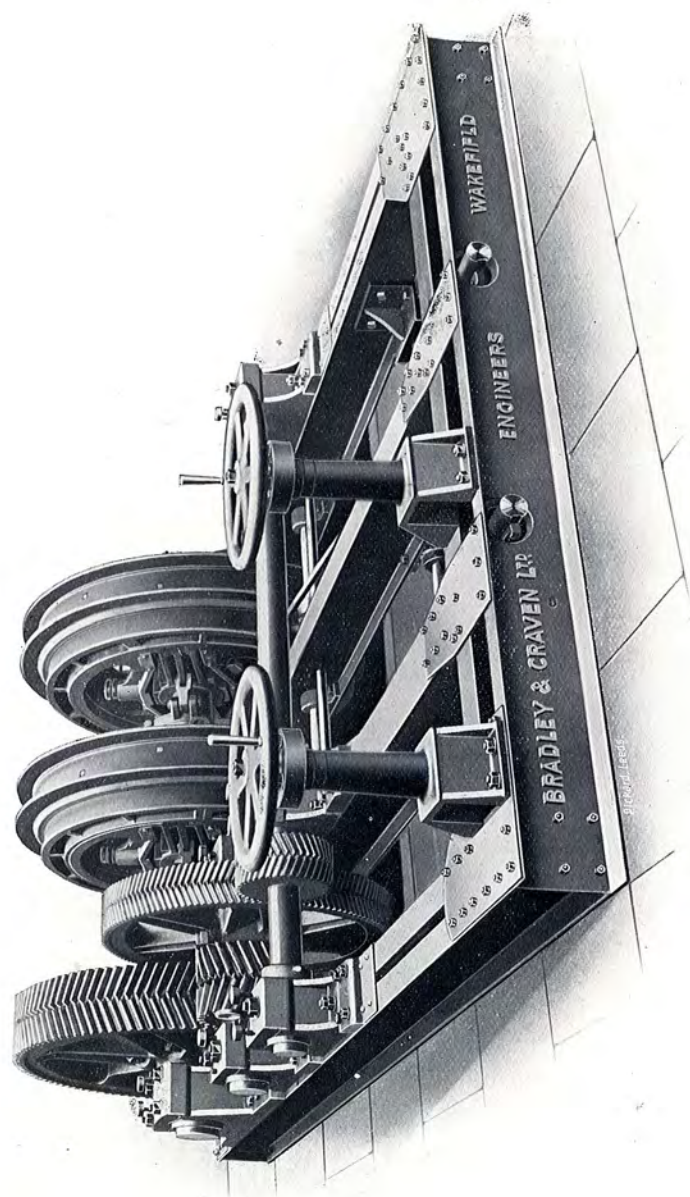
Strong brake-posts are fitted at each side of the drum, worked on the "dead weight" principle, the load being lifted by a steam cylinder provided with water cataract and differential valve gear.

The stop valve is of the double beat type and is 16" diameter.

The reversing of the engines is effected by our improved Steam Reverser.

The Engines are controlled against overwinding by the "Perfex" Patent Gear and Speed Regulator.

The total weight of the Engines and Drum is about 225 tons.



Underground Haulage Gear.

WE have enjoyed for many years an extensive business in various kinds of Underground Haulage, and have every confidence in recommending our various types of Friction Clutches and Gears.

The illustration on the opposite page represents one of a number of sets we have supplied to large South Yorkshire and other Collieries. The friction pulleys of what we term our "Barrow" type, have met with great success. The movable friction rings are expanded by powerful right and left hand screws working in phosphor-bronze nuts; the metal rings which come in contact with each other are made very hard, in order to minimise the wear and tear. The pulleys are fitted with renewable liners cast from a special white iron, ensuring great durability. The gear is steel, of double-helical type, and all machine-cut; this gives a silent drive, while the wear is reduced to a minimum. All the shafts are of high-carbon steel, and the bearings of gunmetal, provided with ample means of lubrication. The whole is mounted on heavy section steel girders, and efficient brakes and operating levers are provided within easy access of the attendant. All parts are made interchangeable and the wearing surfaces are of large area.

We make the pulleys up to 10 ft. diameter, and to deal with any load.

Prices and Specifications on application.

