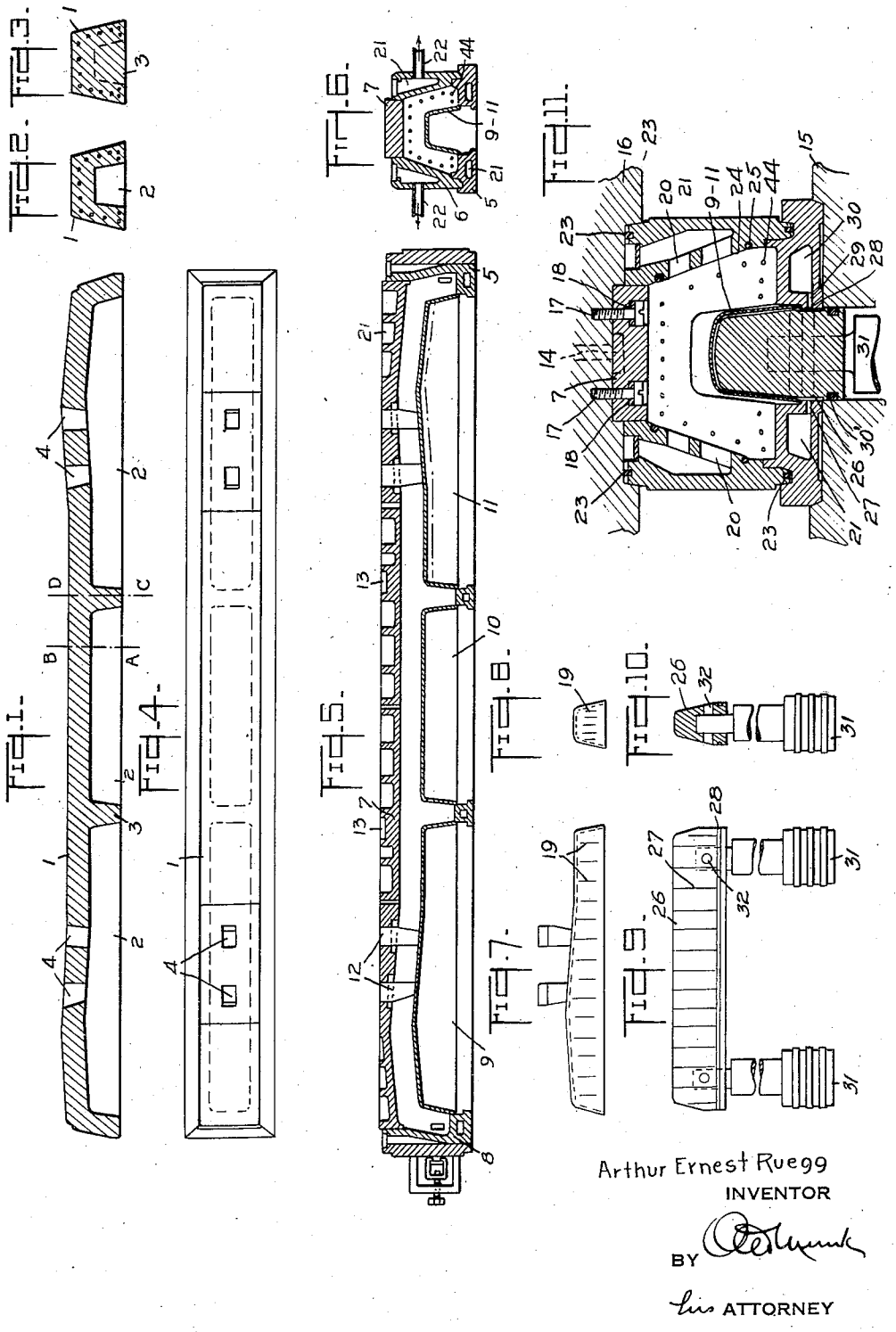
March 2, 1948. A. E. RUEGG 2,437,003

MACHINE FOR MOLDING CONCRETE UNITS

Filed Oct. 21, 1941 2 Sheets-Sheet 1

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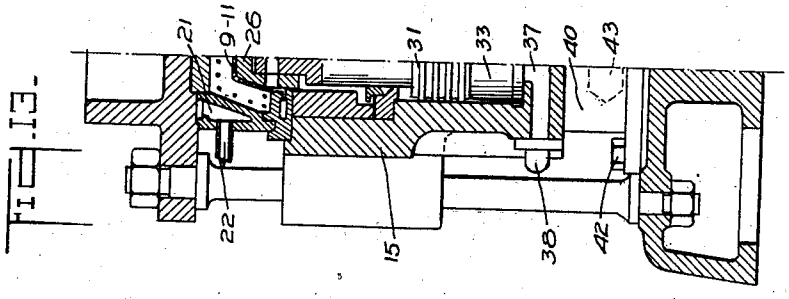


FIG. 13.

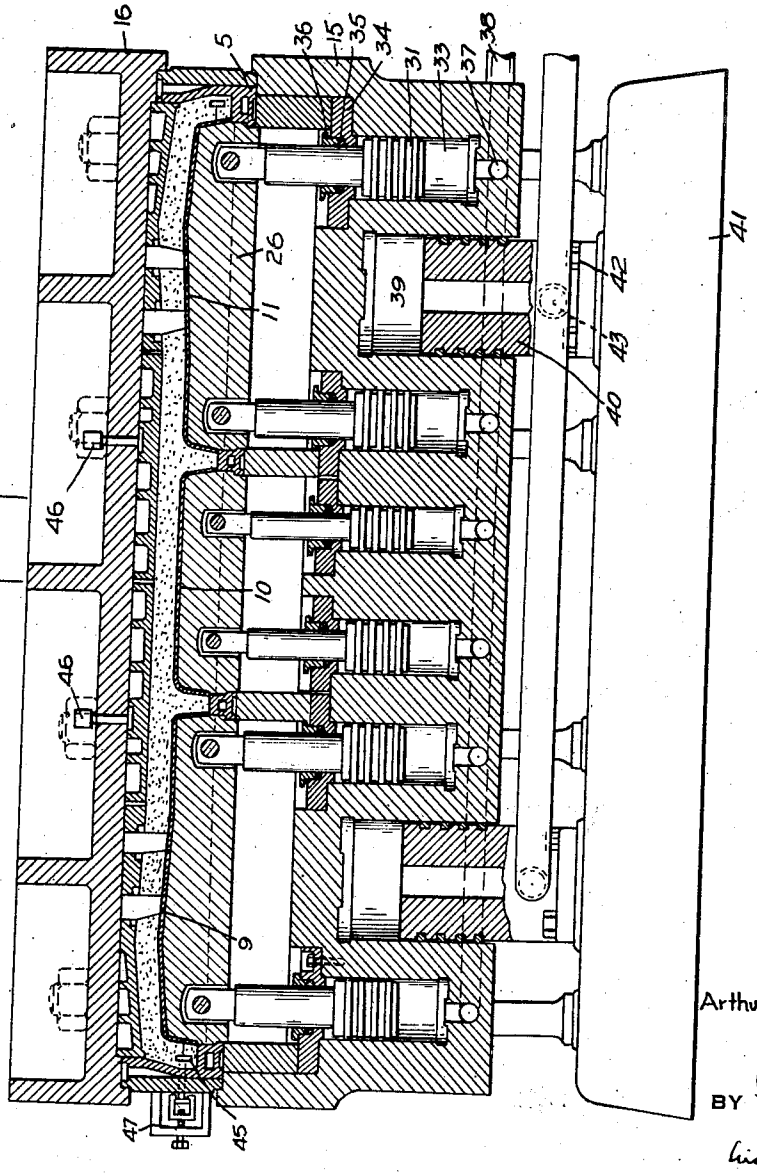


FIG. 12.

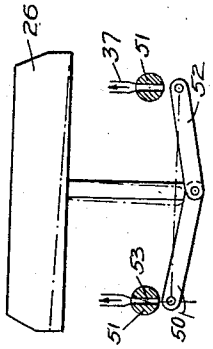


FIG. 14.

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# UNITED STATES PATENT OFFICE

2,437,003

## MACHINE FOR MOLDING CONCRETE UNITS

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Application October 21, 1941, Serial No. 415,898
In Switzerland July 27, 1940

Section 3, Public Law 690, August 8, 1946
Patent expires July 27, 1960

5 Claims. (Cl. 25—41)

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Various methods are known to-day for the manufacture of concrete blocks and units of great strength. According to some of these methods, after the mold has been filled with concrete and suitable steel reinforcement has been positioned in the mold, the latter is subjected to vibration, while water and air in the concrete, which are freed to an increased extent by the vibration, are withdrawn by suction. An additional expedient to augment the action of vibration and suction, is a pressure means to subject the concrete in the mould to pressure.

With this method it has been made possible to manufacture concrete blocks and units for structural purposes, which, until now, have exclusively been made of steel or similar material, to rank equally in strength and permanence. On the other hand until now, the making of such concrete blocks or units has been very costly and irrational, as many particular operations were required for the finishing of such structural elements.

Without collateral explanations it is obvious, that the additional costs of these structural elements until the present made of other materials, were not based on the material costs, but on the circumstantial production methods. The purpose of this invention is to find low cost mechanical manufacturing means, to produce such concrete blocks and units at a lower price than heretofore made of other material, and of a higher quality.

The object of this invention is a machine and mould for the manufacture of structural concrete elements.

The machine to produce these structural concrete elements according to this invention, has for example a hydraulically movable press-table, into which the concrete filled mould is moved, containing under the influence of a pressure means movable pistons, which, connected with the pressheads fitting into steel sheet helmets forming part of the mould, and that at least part of the mould is under vibration by the action of a vibrating mechanism, augmenting the action of the pressure.

According to the invention the arrangement is such, that the mould is first pressed between presstable and presshead, following which the steel sheet helmets are pressed into the mould by the hydraulically operated pistons diminishing thereby the mould contents, causing the displacement of air and water, its withdrawal assisted by suction chambers arranged around the mould and connected to a suction line. Outwards, the mould can appropriately be made airtight and be combined with a system of ducts connecting the inside of the mould with the suction pump.

The pistons of the presstable can be connected

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to a pressure manifold and to the pressure pump or pressure tank. The cross-sectional area is calculated such, that the unit pressure on all steel sheet helmets is the same. The larger steel helmets necessitate a larger cross sectional area of the pistons than the smaller steel helmet. The combined pressure of all the pistons pressing the steel sheet helmets into the mould contents has to be smaller than the combined pressure of the pistons forcing the presstable against the press head. The approximate ratio is about 75:100.

The embodiment of the invention is shown by way of an example in the accompanying drawings for the making of railway sleepers,

Fig. 1 is a longitudinal section of a railway sleeper.

Figs. 2 and 3 its cross-section A—B and C—D,

Fig. 4 is a plan view of a railway sleeper,

Fig. 5 is a longitudinal section of the mould,

Fig. 6 is a cross-section of the mould,

Fig. 7 is a side-elevation of a steel sheet helmet,

Fig. 8 is its cross-section,

Fig. 9 is a side elevation of a presshead with pistons,

Fig. 10 is its cross-section,

Fig. 11 is an enlarged scale cross-section of the mould, steel sheet helmet and presshead,

Fig. 12 is a longitudinal section of the machine with the mould placed in position,

Fig. 13 is a partial cross-section of the above,

Fig. 14 is the pressure controlling means for the cylinders of the pressheads.

The shape of the railway sleeper (Fig. 1) is in its outward appearance adapted from the steel railway sleeper. The under side has cavities 2, divided by cross ribs 3. The slots 4 serve the fastening of the rail fastening plates. Figs. 5 and 6 are composed of the base plate 5, the sides 6, the cover 7, the end pieces 8, and the helmet shaped members 9, 10 and 11. In the cover 7 are slots 12 for the admission of the cores 12*a*, which cause slots 4 in the railway sleeper. The cores 12—*a* producing the slots 4 in the sleeper are fastened to the steel sheet helments 9, 10 and 11 and are pushed up with them through the slots 12. The recesses 13 admit the vibrating hammers 14 (Fig. 11). The base plate 5 is recessed into the press table 15 and the cover plate 7 enters into a recess of the cross head 16. The cover plate is fastened by bolts 17 (Fig. 11) and spring-pressed by rubber rings 18 to the cross head 16. The steel helmets 9, 10 and 11 are set into the base plate 5 in such manner, that they are movable in a vertical direction. These helmets have slots 19 for the passage of air and water. All other mould parts, such as the mould-sides, the cover and the base plates, have also apertures 20, connecting the inside of the mould

with the suction channels 21 which are through a suction pipe connected to a vacuum pump. The mould is made airtight towards the outside by packings 23 so that the concrete is under vacuum through the sucking action of the vacuum pump. The inside of mould walls are covered with cloth 24, attached by rubber strips held in the grooves 25. This cloth will allow the passage of air and water, but not of concrete. The pressheads 26 have grooves 27 connecting to a collecting groove 28. Excess air and water freed through the slots of the helmets 9, 10 and 11 moves through the grooves 27 into the collecting groove 28 and from there through the apertures 29 into the channel 30 of the base-plate 5, which is in turn connected to the suction main. Provisions are made for a packing 30' to prevent cement slurry from passing downwards. The pressheads 26 are connected to the pistons 31 with bolts 32. The pistons 31 slide in the cylinder 33 bored into the press-table 15. Downwards the cylinders are enclosed. Upwards the pistons 31 are made pressure tight by means of the flanges 34, the packing 35 and the stuffing box glands 36. Boreholes 37 connect the cylinders 34 to a pressure manifold 38 with the pressure means. Two further press cylinders 39 are bored into the presstable 15. The plungers 40 are fastened to the base plate 41 with the bolts 42. These cylinders are also, by way of the bore holes 43, joined through a main to the pressure source. The press table 15 is forced upwards by the pressure means as the plungers 40 can not withdraw downwards. The cross head 16 is fastened to the groundplate 41 by the pillars 44, which also serve as a sliding guide for the press-table 15. The vibrating hammers 46, its motive source not described closer, place part of the mould under vibration at a high frequency.

To prevent the pressheads from moving upwards unevenly, and to become tilted as a sequence of variable resistance, the feedline to the pistons is controlled in such manner, that as long as the presshead 26 remains horizontal, the feeding apertures to the two cylinders are left uniformly open, at the instant one piston advances further than the other, its pressure supply is throttled down. A control for this purpose is schematically shown by way of an example in Fig. 14.

In the middle of the pressheads, between the two plungers 31 and the presshead 26, a rod is vertically fastened, its lower end is with the levers 50 of two disc valves 51 and with the rods 52 connected. The disc valves have slot-shaped passages 53. These slotted passages are wider than the also slot-shaped outlets of the inlet pipe and are set to one side of them. In turning the disc-valves in the same direction, the tilted position of the presshead will be leveled, the aperture of the one valve closed while the other remains open.

The procedure of operations is as follows:

After the form is filled and the reinforcing-wires 45 in position, pre-stressed with the tensioning tool 47, the mould is placed into the recesses of the table 15, while at its lowest position. The pressure manifold leading to the press cylinders 39, is opened. The table is lifted, the cover-plate 7 is thrust into the mould, closing it. At the same time the mould is pressed against the cross head 16, closing it up tight by means of the packings 23. Now the vibrators are set in



motion, the suction main leading to the drain channels 21 of the mould, is opened. The pressure manifold leading to the cylinders 23 is simultaneously opened, causing the pistons 31 to be forced upwards. These now press the pressheads 26 into the helmets 9, 10 and 11 and these into the contents of the mould. Excess water and air is forced through the openings of the mould walls aided by the vacuum and sucked away. By reversing the pressure medium onto the counterpressure area of the upper cylinders, the pressheads are withdrawn from the moulded article and mould.

What I claim and desire to secure by Letters Patent is:

1. An arrangement for making concrete blocks and other units, comprising in combination, a mold including a displaceable cover adapted to close the top of the mold and steel helmets movably inserted into and forming part of its bottom, a hydraulic press including a stationary crosshead adapted to cooperate with said mold cover, a movable press plate adapted to support the bottom of said mold, press heads displaceable relative to said press plate to engage into said steel helmets, and means to displace successively said press plate to press the cover on the mold and said press heads to advance said steel helmets into the mold, means to vibrate at least part of said mold during the pressure operation, suction means and a suction manifold connecting said suction means with openings provided in the walls of said mold, said openings being of a size to permit the air and water eliminated from the concrete mixture in said mold by vibration and pressure to escape from said mold through said openings while the entire mass of concrete is retained in the mold.

2. An arrangement, as claimed in claim 1, including means to seal the mold, during the operation of the press against the influx of air from the outside so that the setting of the concrete is effected under vacuum.

3. An arrangement, as claimed in claim 1, including pistons on which said press heads are mounted, said pistons being movable in cylindrical borings formed in the press table to displace said press heads.

4. An arrangement, as claimed in claim 1, including a base plate and pistons mounted rigidly on said base plate, said pistons being movable in cylindrical borings formed in said press table to displace the latter.

5. An arrangement, as claimed in claim 1, in which said press table and press heads include pistons operated from a common source of pressure fluid, and means are provided to shut off the pressure fluid from any piston which is displaced at a greater speed than the corresponding pistons of the same group.

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